VOLUME 16 NO. 5
September — October, 1953

Journal of

MILK and FOOD TECHNOLOGY

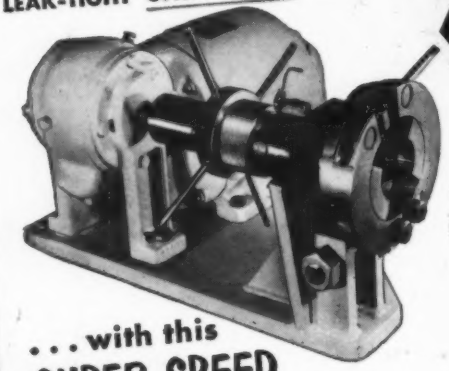
Official Publication

International Association of Milk and Food Sanitarians, Inc.

HOW TO CHANGE TO CLEANED-IN-PLACE LINES IN TWO SIMPLE—LOW COST STEPS

Step 1

CONVERT EXISTING BEVEL SEAT UNIONS TO LEAK-TIGHT GASKET SEAT UNIONS . . .



. . . with this

SUPER-SPEED CONVERSION TOOL

With the simple, positive Super Speed Conversion Tool, you can now accurately and easily convert sanitary *bevel seat* fittings and unions to close-fitting, leak-tight *gasket-seat joints*—to be used as regular "take-down" lines or "cleaned-in-place" piping.

CHECK THESE FEATURES: No dimensional change made during conversion . . . end-to-end dimensions of existing pipe lines remain the same; Convert present lines to C-I-P lines . . . can be done progressively and used while changeover is in progress; Convert bevel seat to gasket seat with substantially flush interior, crack-free, leak-tight joints; Hycar gaskets are precision molded, self-positioning, smooth, non-toxic, fat resistant, non-absorbent, and can be sanitized by steam to 250° F.

and here's the result!

View above shows the accurate, clean-cut grooves made in the fitting ends by the Conversion Tool to receive the precision-molded Hycar gasket. Gasket is self-positioning on both male and female ferrules or fitting ends. Completed joint is ready for C-I-P installation. Tools are available in both motor-driven and hand-operated models, to convert 1½", 2", 2½" and 3" fittings.

Step 2

GRADUALLY CHANGE TO TRI-CLAMP CLEANED-IN-PLACE LINES . . .

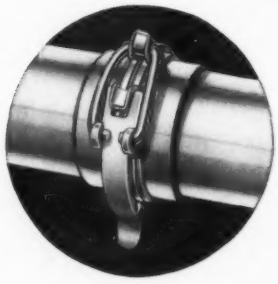
After converting existing fittings, you can extend lines with Tri-Clover TRI-CLAMP fittings . . . which provide a joint consisting of a flange type ferrule, precision molded gasket, and the TRI-CLAMP itself . . . a spring clamp which grips ferrule edges with a snap-action toggle assembly . . . always ready for instant assembly or disassembly.

TRI-CLAMP recessless ferrule, showing grooved lip to receive molded gasket.

Special precision molded Hycar gasket provides equal pressure around joint.

TRI-CLAMP positive snap-action spring clamp, with toggle locking device securely attached.

At a flick of the wrist, you complete a positive sanitary leak-tight joint. When used in either "take-down" or "C-I-P" installations, substantial savings have been made in initial material cost per joint over conventional union nut ferrule assemblies. When cleaned in place, users have reported substantial reductions in cleaning costs by the use of TRI-CLAMP stainless steel fittings.



The new TRI-CLAMP stainless steel series is available in the full line of Standard Sanitary Type fittings and valves, for both "permanent" and "take-down" sanitary lines, in 1½", 2", 2½", 3" and 4" sizes, all fabricated from type 304 stainless steel . . . offering highest quality material and workmanship.

CT353

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TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

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See your nearest TRI-CLOVER DISTRIBUTOR

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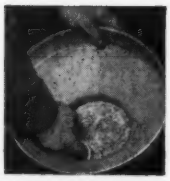
A coast-to-coast survey of more than 175,000 farmers, made by an independent research organization, once again provides conclusive proof that Rapid-Flo is the outstanding choice of quality milk producers.

More dairy farmers use Rapid-Flo because they're "Safer"—"More Retentive"—"More Uniform." This is more than just a vote for Rapid-Flo—it's a tribute to the work of milk sanitarians toward improved quality milk production. J & J Field Service Representatives will continue to assist you in every way possible to improve quality, avoid loss and cut costs.



1. After filtering each can of milk (10 gallons or less), the producer should carefully remove the used filter disk from the strainer and place it on a cardboard to dry.

2. When filter disk is dry, it should be examined closely. The producer can identify the sediment or extraneous matter to determine its origin, and take precautions to prevent its reoccurrence.

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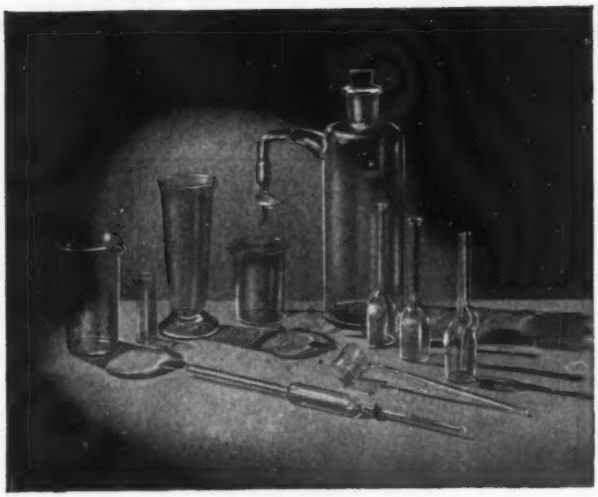

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INCLUDING MILK AND FOOD SANITATION

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One of a series of informative advertisements

The Problem of Chemical Residues in Milk and Dairy Products

by

WILLIAM A. HADFIELD

Technical Service Department

Pennsylvania Salt

Manufacturing Company

Any chemical residue left on milk utensils or equipment must be considered undesirable if it produces off-flavors or odors in milk, or interferes with starter culture activity for special milks and cheeses. Therefore, it is important for the producers and processors of milk or dairy products to select a sanitizer which will not leave a chemical residue capable of causing the conditions mentioned.

Chlorine solutions made from the sanitizer, B-K® Chlorine-Bearing Powder, are highly effective, yet produce none of the conditions described in the preceding paragraph even when used at concentrations that give a 99.9% kill of representatives of Gram positive and Gram negative groups of bacteria within 30 seconds. These results are obtained using the Johns' Glass Slide Technic and the Weber-Black method.

The foregoing helps to explain why hypochlorites have found widespread and continued use in the dairy industry for the last forty years . . . since the era of chemical bactericides was introduced by the advent of "B-K". Chlorine solutions produce quick bacteria kill without imparting a chemical residue that might be considered detrimental to milk and other dairy products.

Additional information on sanitizing and cleaning—including latest bulletins on C-I-P milk lines and bulk holding tanks—is available without charge from the makers of B-K Chlorine-Bearing Powder. Write to Pennsalt Chemicals, 413 Widener Building, Philadelphia 7, Pennsylvania.

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...to the last drop

Seal-Hood—the long-skirted closure—snaps easily on and off, as often as necessary. No wires, forks or prying tools required. And the hand need never touch the pouring lip.

Seal-Kap combines seal and cap in a compact, snug-fitting unit. The original "twistoff-snap on" closure securely protects the pouring lip... prevents leakage even when bottle is tilted.

From capping time to delivery, many caps effectively guard bottled milk against contamination. But for safeguarding milk both before and after delivery, none can match the "last drop" protection assured by Seal-Hood and Seal-Kap closures (disc and cap in one compact, easy-to-open unit). Wherever they're used, both Seal-Hood and Seal-Kap are protecting milk and milk products . . . *completely*. And dairies using these one-piece closures, find their single-operation economies more than welcome.

AMERICAN SEAL-KAP CORP.

11-05 44th DRIVE

LONG ISLAND CITY 1

N. Y.

There's nothing like it for SPEED!

Cemac has speed that no other fillers can match . . . regardless of what products are being run.

And with faster operation at the filler, there's more pep in your entire operation. You get your money's worth from all of your equipment. Costs are lower. Time is saved. And your profits take a nice step upward.

Ask your Crown Representative to *prove* that Cemac can give you the finest filling you've ever had. And, remember, Cemac in combination with the P-38 Dacro Cap gives you the finest operation of all.

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NOTE: These are rated capacities for Cemac 28 . . . but *they are exceeded* in dairies from coast to coast, throughout the daily run.

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The Greatest Performer of them all

Built in 3 sizes:

CEMAC 10
CEMAC 14
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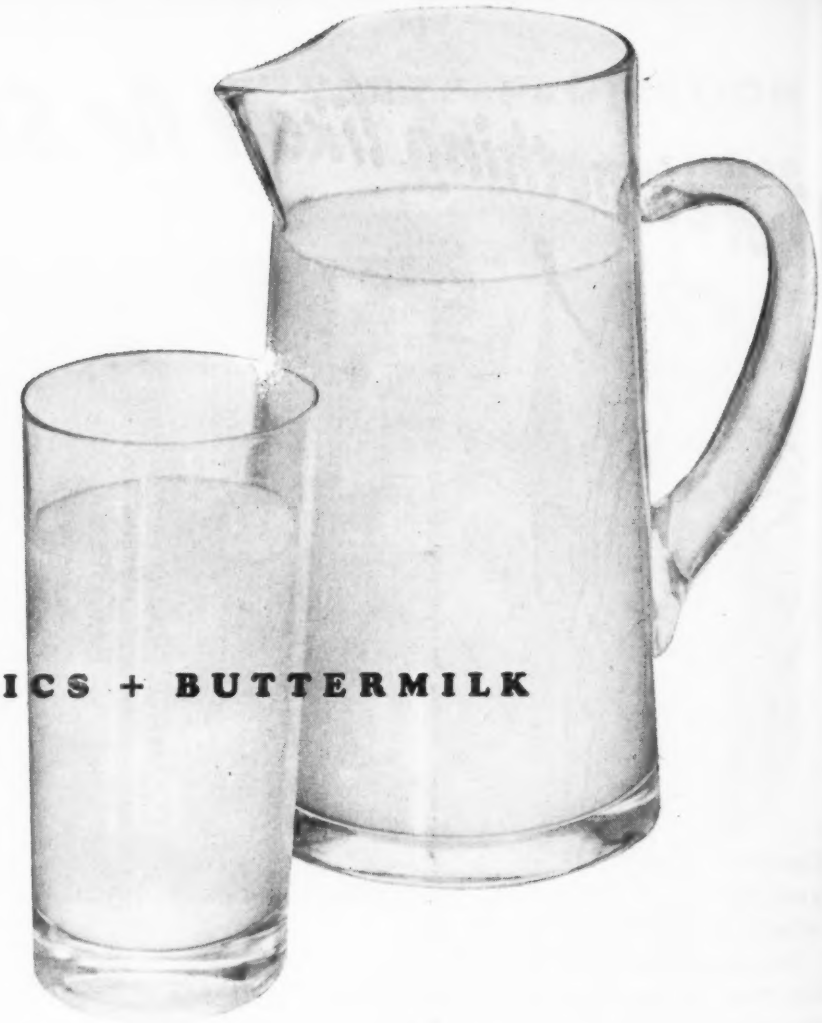

ANTIBIOTICS + BUTTERMILK

today, more and more clinicians are finding buttermilk useful in counteracting the undesirable intestinal side effects frequently associated with the administration of antibiotics[1] • when antibiotics or chemotherapy adversely influence the normal intestinal flora, restoration of a healthy bacterial balance is important • current medical studies and reports from many doctors indicate marked therapeutic benefit is obtained from both the simultaneous and subsequent administration of buttermilk[2] • even in cases of serious anorectal complications[1] • WHY BUTTERMILK? • because it is an excellent source of "friendly flora" that promote good digestion and elimination • because buttermilk also contributes to the general health of the patient • it provides all the nutrients of whole milk with the exception of fat — here is a therapeutic food readily available, easily tolerated, pleasant tasting and low in cost • WHY *BORDEN'S* BUTTERMILK? • because it is made by exacting standards, from the careful choice of "starter" right down to the final check of critical culturing time • the same quality controls are applied to it that are used in the processing of highly perishable fresh milk • BORDEN'S BUTTERMILK is uniform, and pleasant tasting — not overly acid • it's truly buttermilk at its best.

1. Manheim, S. D.: New York State J. Med. *51*:2759 (Dec.) 1951.
2. Tice, L. F.: Philadelphia Med. *45*:1135 (Mar. 25) 1950.

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If you are a public health official, you can take pride in the fact that fresh, healthful milk is now available almost everywhere in its most convenient form . . . in the Canco disposable milk container.

Much of the credit for this advance must go to public health officials, since it is you who recognized early that the disposable milk container is one of the great milestones on the road to better milk distribution.

So acceptable is this container today, that billions are produced by Canco each year, and the demand from homes . . . offices . . . factories . . . schools . . . is constantly growing.

Canco appreciates your support of the disposable milk container —the container that helps people live better.

CONTAINERS . . . to help people live better

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Measures up in every way as the quaternary of choice

IN THE DAIRY INDUSTRY, more than any other industry, the importance of using only the best in sanitizing methods cannot be over-emphasized.

In Roccal, the *original* quaternary ammonium germicide, the dairy industry is offered a product that is laboratory controlled and tested. The uniform quality of Roccal means uniformly good results in doing a proper sanitizing job.

Roccal is a powerful germicide. In recommended dilutions, it is non-poisonous, non-irritating to the skin, virtually odorless and tasteless.

In the dairy, Roccal can be used for every sanitizing job. For tank trucks, weigh tanks, pasteurizers, separators, bottle filling and capping machines, to keep walls and floors sanitary.

Try Roccal for just one week and watch your bacteria counts go down . . . down . . . down! Write us for new booklet describing Roccal's uses in the dairy plant and on the producing farm.

USES IN DAIRY INDUSTRY

To Sanitize:

- MILKING MACHINES
- MILK CANS
- TEAT CUPS
- WEIGH TANKS
- COOLING TANKS
- PASTEURIZERS
- TANK TRUCKS
- SEPARATORS
- BOTTLE FILLING MACHINES and AS HAND and TEAT WASH

In recommended dilutions Roccal is:

- ☑ POTENT
- ☑ NON-POISONOUS
- ☑ TASTELESS
- ☑ ODORLESS
- ☑ STAINLESS
- ☑ NON-IRRITATING
- ☑ NON-CORROSIVE
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Editorial Notes

PRESIDENTIAL ADDRESS*

Forty-two years ago a small group of far-sighted men interested in human welfare and the preservation of public health met in Milwaukee and established the forerunner of the International Association of Milk and Food Sanitarians. This is the 40th annual meeting of this group which now boasts a membership of 3543 and whose publication is read in 56 countries of the world. We are proud of our accomplishments and our standing in the professional world.

For the first time in our history we are meeting on the campus of an educational institution. It is significant that our meeting place is the first agricultural college in America—founded 98 years ago. May I ask your indulgence while I inject a personal matter. I am particularly happy and proud that my term of office will conclude on the beautiful campus of Michigan State College. To come back to this beautiful state and this historic campus under these circumstances is truly a homecoming for my family and me. It was here on this campus that I met and married my wife. It was here that we acquired many true and life long friends. It was here in this great state that our children were born and spent their early childhood. We are happy indeed, to renew friendships, to reminisce on by-gone days, to learn of new things and the success of others; we will long remember this occasion.

Dean Harden and Mr. Ettesvold have made each and everyone of you feel that you are a part of Michigan State College and the State of Michigan. In my official capacity may I add my word of welcome. In this, the 40th annual meeting of Milk and Food Sanitarians brought together by this association, we are met to re-examine our responsibilities, to analyze our progress and to plot our future course. Much effort and thought has gone into the planning and details of this three day meeting. Our hope is that each of you will go home enriched with the knowledge shared here through the technical papers, committee meetings, and exchange of experience in milk and food sanitation work. May each of us be inspired to do a better job upon our return to our respective homes. May each of us go home with a greater regard for and a better understanding of the objectives and functions of the I.A.M.F.S. May each of us resolve to help put this organization on the high professional plane its membership aspires.

May I, for a few moments re-examine our progress, not in the field of sanitation, but as an organization. It has been my privilege to be a member of this organization for 22 years. I hold the men who have guided the destinies of the I.A.M.F.S. over that period with the highest esteem. Knowing them all personally has been an inspiration. It is a rich experience to work ones way along the progressive steps it takes to be the president of this organization. It is in this capacity that one develops deep respect and warm personal feelings for the men who devote their time and energy toward making a professional organization such as ours, the leadership that it now enjoys.

I should like first of all to pay tribute to the men with whom I have served on the Executive Board. I learned as a Vice-President that the I.A.M.F.S. is not a one or two man organization. I learned that your officers are violently in love with the I.A.M.F.S. and for what it stands; that these men are not interested in personal glory or advancement; that the interest of the I.A.M.F.S. is first and foremost in all their actions. I learned early that every man on the Board has heavy and definite duties throughout his six year term. I learned that matters are always settled collectively after complete and exhaustive debate. I learned that each year it requires five full days of continuous sessions of the Board and hundreds of letters of correspondence to properly handle the affairs of the association. I learned also that the best way to become unpopular is to shirk your duty.

It is necessary that we select time limit to mark our progress. May I briefly itemize for you the accomplishments or progress of this association over the past two years. I have selected this period because some very definite changes took place in 1951 which effected our development very materially.

First, during that year by affirmative vote of the membership, you liberalized the membership requirements to provide industry persons with the same status as non-industry personnel. Coincidently, the death of Bill Palmer made it necessary to consolidate our operations. You will remember that our business, secretarial and editorial work, was all done on a voluntary or part-time help basis. Our activities were too wide spread and heavy for this type of operation. Efficiency could not be had under this arrangement. We were faced with bankruptcy. How well I remember that hot June day in 1951 in St. Louis when your Executive Board struggled for a solution. Under the inspiring leadership of President Ken Weckel, plans were developed to employ "Red" Thomasson as Executive Secretary and Managing Editor, establish a central office and setting up of a business operation that could not be had by part-time officers. Those were dark days. Was the decision of your Executive Board justified? May I make a comparison on three or four items.

(1) Bank balance

*Delivered at the 40th Annual Meeting of International Association, Inc., at Michigan State College, E. Lansing, Michigan, Sept. 1-3

July 15, 1951 deficit	$ 600.00
July 15, 1952	4,987.69
July 15, 1953	9,043.51

It is of particular significance that no increase in dues or subscription rates have ever been made or contemplated. We pay the same dues as we did three years ago.

(2) Membership

July 15, 1951	2500
July 15, 1952	3180

More than 1200 unpaid members were dropped during this period.

July 15, 1953	3542

There are no unpaid members.

(3) Number of affiliates

July 15, 1951	11
July 15, 1952	16
July 15, 1953	25

(4) During 1952 our Executive Secretary visited, at International's expense, 6 affiliates. In 1953 he visited 12 affiliates.

It is the feeling of your Executive Board that the decision of 1951 was justified. We are sure the membership has the same feeling. An energetic Executive Secretary has done a real job.

Among other developments taking place during this period was the creating of the $1000.00 Sanitarians Award and the Citation Award, both of which will be repeated at this meeting.

During the past twelve months several progressive activities have been recorded. Early in the year we became a member of the Food Law Institute and in June we were invited to become affiliated with the American Association for the Advancement of Science. We are proud to be the first such organization to be classified under Sanitary Science. The I.A.M.F.S. also became a co-sponsor of the National Conference on Trichinosis.

During the year a careful and detailed study of the Constitution and By-Laws was made by the Board and three members who are secretaries of affiliates. These proposed changes appeared in the July-August issue of the Journal and will be considered this afternoon at the business session. The authors of the present Constitution and By-Laws did a fine job under trying circumstances. If an organization is to progress, it must bring its foundation up to modern techniques. Thus we found it necessary to propose some changes.

Committee activities are the backbone of any organization. It has been said that the world waits upon the findings of our committees with regard to all the various problems in food sanitation. Few persons realize the influence over the years on food and milk sanitation policies and developments made by such committees as the Sanitary Procedure, Dairy Farm Methods, Laboratory Procedure, Communicable Diseases Affecting Man, Advisory Committee on Milk Regulations, and Food Equipment Standards. This afternoon we will learn the new developments in these fields.

For some years the problem of professional development has been before this group and more particularly before the Executive Board. This year your Executive Board placed this subject high on the list of priorities. I have had an opportunity to review the work of the Committee on Professional Development. This Committee has taken a positive and realistic view of the problem. Their report will include such things as:

(1) Definition of a sanitarian
(2) Qualifications
(3) Experience
(4) Grades or classifications for sanitarians
(5) Legislation

With the permission of the Committee Chairman, I am quoting part of the Committee's report in regard to registration or licensing.

> "While the Committee is not unalterably opposed to registration and takes an open minded view of it, the Committee feels that this has been used as a means to an end, rather than an end in itself. In the Committee's judgment, registration should be used to demonstrate professional proficiency and professional attainment based upon definite high level qualifications and demonstrated ability. It should never be used as a device to insure the recipient of job security nor to protect mediocrity. Registration may have a function in professional development, but it should not be placed ahead of more important factors. Like other professions, we must establish the ground work of professional qualifications before taking a step that involves the enactment of legislation."

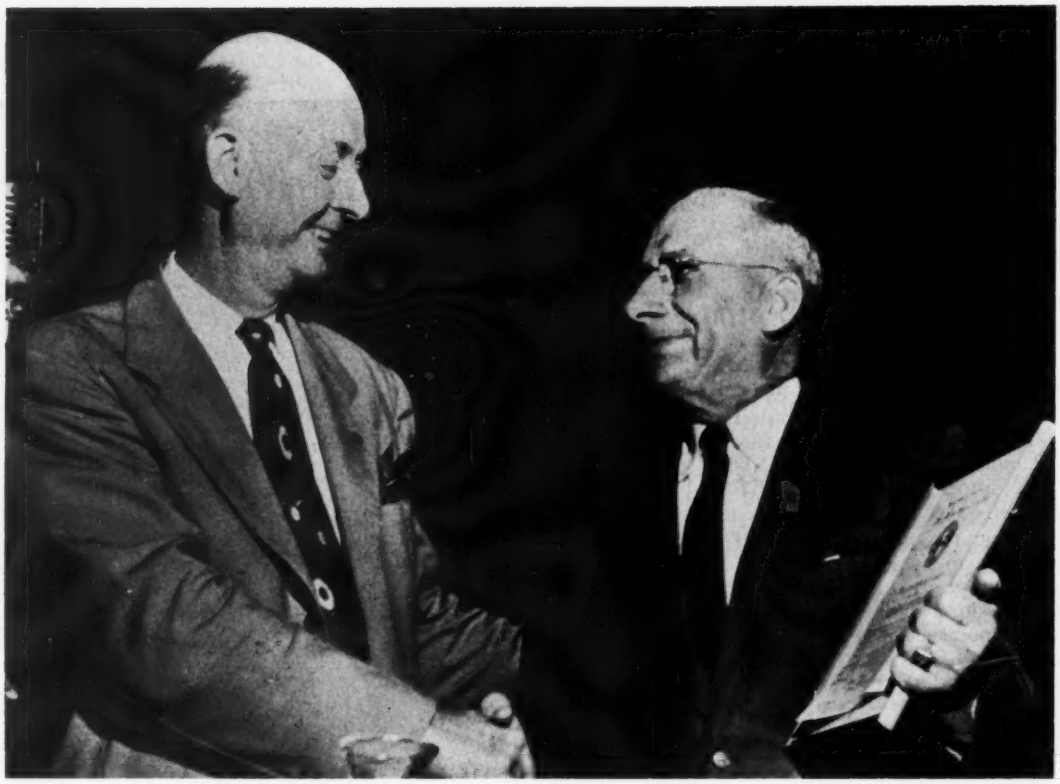
I should like to reiterate again what President Thomasson told this Association at Minneapolis last year.

> "Make no mistake about it, you cannot legislate yourselves into professionalism."

Our founding fathers in 1911 faced problems and concepts of sanitation vastly different from those of today. Nevertheless, they exhibited vision and foresight. I am sure that if those men were to return today for this 40th annual meeting and witness this fine audience, this excellent technical program, the fine spirit of cooperation and our efforts to fulfill the objectives that have so long been our guiding light, their hearts would be glad. Let us resolve to fulfill the vision and the dreams of these men. We can do this by leading the field, by service to our membership and by hard work.

The field of milk and food sanitation is growing rapidly. Opportunities for service are vast. In the years to come, as in the past, the International Association of Milk and Food Sanitarians shall be the symbol of pride to the milk and food sanitarian.

Harold J. Barnum, President
I.A.M.F.S.
East Lansing, Michigan
September 1, 1953



THE SANITARIANS AWARD

The Sanitarians Award for 1953 was presented to Dr. E. F. Meyer by Mr. H. L. Thomasson, Chairman of the Association Committee on Recognition and Awards.

During his incumbency as head of the food control work in the health department at Grand Rapids, Dr. Meyer prepared and secured the enactment of one of the first local milk ordinances in Michigan, and a little later a model state ordinance. In 1939 he prepared and obtained passage of an ice cream ordinance.

When Dr. Meyer came to Grand Rapids, approximately 50 percent of the milk was pasteurized. About 80 dealers sold raw milk exclusively. Now 100 percent of the milk is pasteurized.

Dr. Meyer early proved the desirability of using insulated and sanitarily constructed tanks for hauling milk. He was among the first to inaugurate a program of mastitis control, and to utilize the direct microscopic test for checking the quality of milk; for encouraging self inspection by industry of its own milk supply; for instituting improvement in ice cream and cottage cheese sanitation; by successfully developing a restaurant ordinance back in 1936, unique by its inauguration of a scoring system for restaurants; by preparing a bakery sanitation ordinance; by setting up a complete ante-mortem and post mortem inspection program for all meat, the expense of which is borne by the packers; and by securing enactment of a general food ordinance that included all food establishments.

Dr. Meyer was born in Canada but moved to a Michigan farm in 1890. He graduated from the Grand Rapids Veterinary College in 1916 and then practised veterinary medicine. After serving in the Veterinary Corps, United States Army, during World War I, Dr. Meyer was appointed as Assistant State Veterinarian in 1919, and was assigned to animal disease control. In 1920 he pioneered in Bovine Tuberculosis Control on an area basis, introducing the intradermal test.

In 1927 Dr. Meyer came to Grand Rapids Health Department as Chief Milk Inspector. In 1930 he was promoted to Chief of the Milk, Meat and Food Division. He has served the Grand Rapids Health Department continuously since 1927. During the past year the entire field of environmental health has been under his jurisdiction.

He is a member of East Congregational Church in Grand Rapids, the Masonic Lodge, the American Legion, and is active in Boy Scout organization work. Dr. and Mrs. Meyer have two daughters and a son who is attending Junior College. He retired from active service in the Health Department last June.

The Sanitarians' Award is sponsored jointly by—

The Diversey Corporation

Klenzade Products, Inc.

Mathieson Chemical Corporation

Oakite Products, Inc.

Pennsylvania Salt Manufacturing Company.

THE FORTIETH ANNUAL MEETING— A GREAT ASSEMBLY

The Fortieth Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC. was held at the Michigan State College, East Lansing, Michigan, September 1-3, 1953. The accommodations were excellent, the meetings were well attended, and the program was good. The registration ran up to 325.

The direct membership totals 721 and the affiliate membership runs to 2821, making a total of 3542. This membership is distributed over 48 states, Canada and 56 foreign countries. The Journal circulation approaches about 5000 copies per issue.

Following the practice that had been shown to be so effective last year, the program was divided into general sessions, milk section meetings, and food section meetings. Interesting and informative motion pictures preceded several of the sessions.

EXCELLENT DEMONSTRATION TALKS

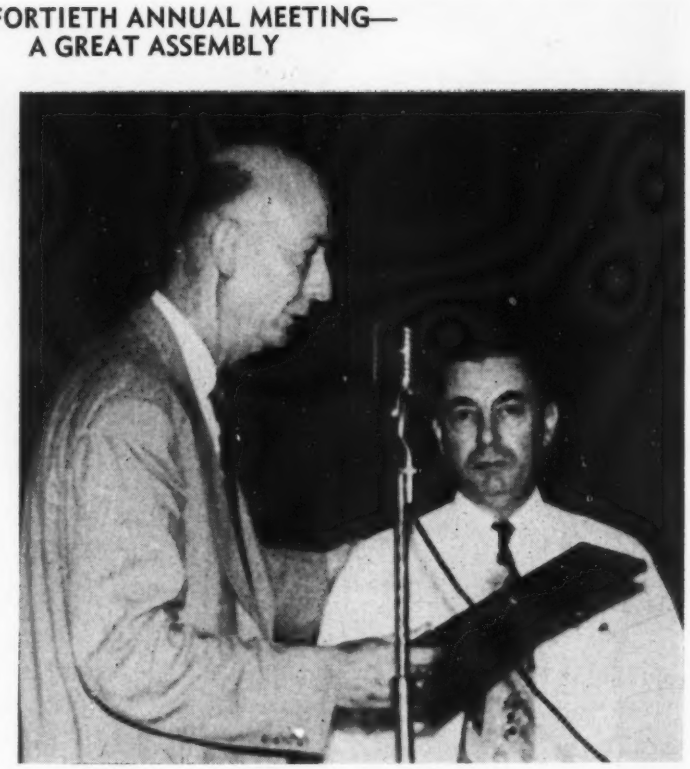
A special afternoon program was presented by the Department of Bacteriology and Public Health under the supervision of Dr. W. L. Mallmann and associates.

This program consisted of ten 10-minute talks and demonstrations of various aspects of Bacteriology and Public Health which would be of interest to sanitarians. Between 180 to 200 sanitarians were divided into ten groups of 18-20 people. Graduate students acting as guides took the various groups to each demonstration-talk. The demonstrations were scattered over four floors of Giltner Hall. By having small groups each individual was afforded a front seat at each demonstration-talk.

A brief resume' of each demonstration-talk follows:

Demonstration 1: The cultivation of viruses was presented by Miss Lenore Jones, graduate assistant, majoring in Virology. The method of growing viruses in chick embryos was presented. The talk was illustrated by displays of infected embryos.

Demonstration 2: Tissue cultures were presented by Dr. Walter N. Mack, Associate Professor of Bacteriology. Methods of growing tissue cultures was presented. Tissue cultures of normal series and cancer series showing growing under the microscope.



Mr. Clarence W. Weber receives Citation Award

Demonstration 3: High velocity jet washing was presented by Mr. Jack Tadman, graduate assistant, majoring in Sanitary Bacteriology. Apparatus for research in high velocity jet washing was demonstrated along with laboratory stains simulating tea and coffee on chinaware. This demonstration was a presentation of research in progress.

Demonstration 4: Isotopes and aerosol contamination was demonstrated by Mr. Antone Fontes, graduate assistant, majoring in Sanitary Bacteriology. A demonstration was shown of the aerosol spread of test organisms tagged with Iodine 131 when injected into the water stream of a modern drinking fountain. This demonstration like the previous one was a presentation of research in progress.

Demonstration 5: The detecting of bacteria on surfaces was presented by Mr. Karl Kereluk, graduate assistant, majoring in Sanitary Bacteriology. The measuring of bacterial populations on surfaces by the swab technique and the contact agar plates was presented. The new drop agar plate count was also shown.

Demonstration 6: The membrane filter technic was demonstrated by Dr. Frank Peabody, Assistant Professor of Bacteriology. An explanation of the technique along with the running of a water sample was presented. Eosin methylene blue agar membranes showing colonies of coliform organisms were displayed.

Demonstration 7: The detection of antibiotics and bacteriophage in milk was presented by Mrs. Carol Frank, laboratory assistant in Dairy Bacteriology. The importance and significance of antibiotics and bacteriophage in milk was presented along with plates showing methods of detecting antibiotics and bacteriophage.

Demonstration 8: The effect of psychrophilic bacteria in milk was presented by Dr. C. K. Smith, instructor in Bacteriology. Current research in the studies of psychrophilic bacteria in milk was presented. Samples of milk showing low standard plate counts and high psychrophilic counts were available for taste tests to show the relationship of psychrophilic bacterial populations and the keeping quality of the milk. The influence of temperature storage was stressed along with the importance of cleanliness in the pasteurization plant.

Demonstration 9: Influence of acidity on the contamination of food was presented by Dr. R. N. Costilow, Assistant Professor in Bacteriology. Discussion of the various types of micro-organisms causing food spoilage and the influence of acidity in their control was presented. Food products showing spoilage were on display.

Demonstration 10: Sequestering and chelating agents and detergents was showed by Mr. Robert Telder, in charge of sanitarians on campus. A series of demonstrations of sequestering agents and chelating agents in hard water was showed along with detergent mixtures of alkaline cleaners and wetting agents.

In spite of the unseasonable heat, the groups remained intact throughout the entire program, and many of them were strong in their praise of the program.

This type of program was possible by attendance meeting on a University campus. Dr. Mallmann hopes that this will set a pattern for future meetings and is hopeful that other institutions will invite the Association for their meetings.

At the banquet session, the Committee on Recognition and Awards presented the citation award for distinguished service to the International Association of Milk and Food Sanitarians to Mr. Clarence W.Weber, who had been chosen by the Executive Board.

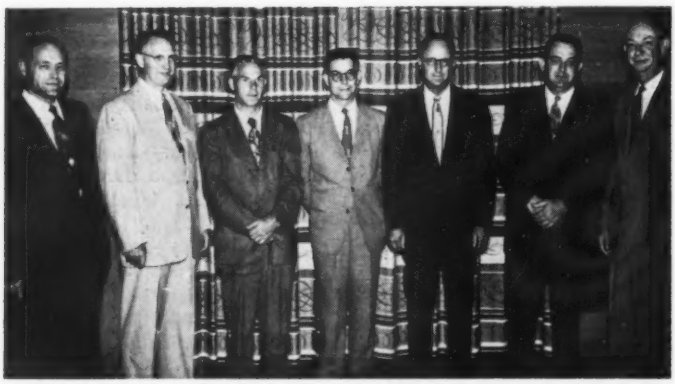
The Certificate of Citation as presented to Mr. Weber is as follows: *"Because his diligent work in behalf of our Association has contributed greatly to its growth and outstanding reputation; because he has gladly devoted so much time and effort to important work as chairman of the Food Handling Equipment Committee and as a member of the Sanitary Procedures Committee;because of his long and faithful service as Secretary-Treasurer of The New York State Milk Sanitarians Association, one of our most outstanding affiliates, this citation is awarded for distinguished service to International Association of Milk and Food Sanitarians, Inc."*

The Sanitarians Award of a citation and purse of $1000 went to Dr. E. F. Meyer, Chief of the Milk, Meat, and Food Division of the Grand Rapids Health Deptment, made possible by the generosity of the Diversey Corporation; Klenzade Products, Inc.; Mathieson Chemical Corporation; Oakite Products, Inc.; and the Pennsylvania Salt Manufacturing Company. (See page 211).

The Sanitarians Award as presented to Dr. E. F. Meyers is as follows: *"For outstanding service to his community in the field of Public Health; for his exemplary conduct as a sanitarian; for his contribution to the advancement of the profession of the sanitarian; for participation in many other activities for the welfare of his community."*

The main address of the banquet session was made by Dr. J. G. Hayes who entertained us with his amusing "lecture" on the structure of the dairy cow.

At the business meeting the proposed amendments to the Constitution as carried on pages 198-200 of the July-August issue of the Journal, with slight modifications,



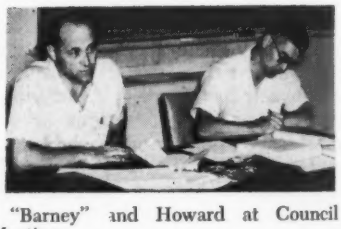
Officers and Executive Board

H. L. Thomasson receives Past Pres. Certificate from Pres. Barnum

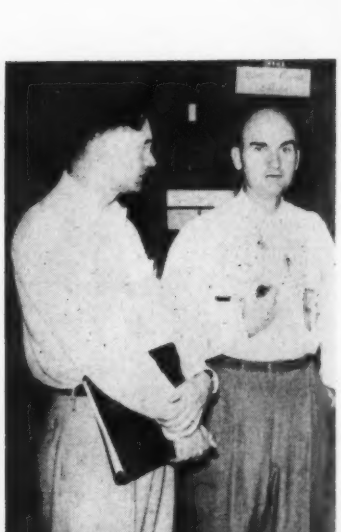
Executive Board at work.

Farm Methods Committee Meeting

Harold S. Adams, newly elected Sec. Vice. Pres.



"Barney" and Howard at Council Meeting.



W. L. Ettesvold, Pres. Michigan Association of Sanitarians and Robert Lyons, Sec-Treas.

John P. Greze, Rep. Oakite Products, Inc.

were adopted All the officers were elevated to the next higher position. The new Second Vice-President is Harold S. Adams of the University of Indiana, Medical Center, Indianapolis. It was voted to change the name of the Journal to *Journal of Milk and Food Sanitation* beginning with the January issue.

A chicken barbecue was held on the Michigan State College campus on the banks of the river. It was prepared and served excellently.

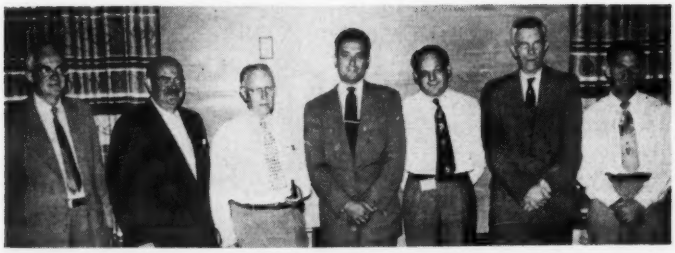
Nineteen door prizes were awarded to holders of the successful numbers given for attendance at the openings of the respective sessions. These were as follows:
Door Prize Winners Annual Meeting 1953—East Lansing, Michigan

Box of cheese donated by the Iowa Assoc.—Won by M. J. Dotter, 1760 Oak St , Columbus, Ohio.

Gallon of maple syrup donated by the South East Penna. Assoc.—Won by John Schlegel, 521 N. DeQuincy, Indianapolis, Ind.

Bushel of Washington apples donated by the Washington Assoc.—Won by James H. Shrader, 23 E. Elm Ave., Wollaston, Mass.

Black Hills jewelry by the South Dakota Assoc.—Won by James Ever, Cedar Rapids, Iowa.



Representatives of Klenzade, Diversey, Mathicson and Pennsalt sponsors of Sanitarians Award.

Council Meeting.

Um! Boy! was that barbecued chicken good

"Concentration on the task at hand" Buffet supper Monday evening

Meeting of Committees with Executive Board, from three angles

Box of cheese donated by the Wisconsin Assoc.—Won by Fred H. Ehlers, Chicago Health Dept., Chicago, Ill.

Virginia ham by the Virginia Assoc.—Won by John Veenstra, Flint, Mich.

Rocky Mountain trout by the Rocky Mountain Section Assoc.—Won by Frank Kinney, Sioux City, Iowa.

Illinois steaks donated by the Illinois Milk Sanitarians Assoc.—Won by Paul A. Wargo, Mill Hall, Pa.

Missouri steaks from the Missouri Assoc.—Won by William Amy, Corydon, Ind.

Michigan made slippers by the Michigan Assoc.—Won by Charles Livak, Penn. Dairies, York, Pa.

Michigan apples by the Michigan Assoc. 1 bushel won by James Meany, 8948 Laflin Ave., Chicago, 20, Ill., and 2 bushels won by David Kronick, Pontiac, Mich.

Tillamook cheese donated by the Oregon Assoc.—Won by Chester Lackie, Detroit Health Dept., Detroit, Mich.

3 Cases of Oklahoma oil donated by the Oklahoma Assoc. 1 case won by H. P. Woodworth, Detroit, Health Dept, Detroit, Mich.; 1 case won by J. Fuller, Port Huron, Mich.; and 1 case won by Jack Hatlen, Seattle, Wash.

Box of cigars by the Connecticut Assoc.—Won by Mills Garrison, Ada, Oklahoma.

1 bushel of oranges by the Florida Assoc.—Won by Herb Dunsmore, RFD No. 8 Box 570, Pittsburgh, 9, Pa

1 gallon maple syrup by the North Central Pennsylvania Assoc.—Won by Robert Rau, 335 S. 11th St., Saginaw, Mich.

Donation by the New York Assoc.—Won by G. W. Molyneux, New York Association, Albany, N. Y.

Tickets to the Indianapolis Races by the Indiana Assoc.—Won by Carl Voorheis, Chicago, Ill.

Minnesota cheese donated by the Minnesota Assoc.—Won by Harold Ruhstorfer, 227 N. Michigan, Saginaw, Mich.

THE KEEPING QUALITY OF PASTEURIZED MILK AS INFLUENCED BY THE GROWTH OF PSYCHROPHILIC BACTERIA AND THE ADDITION OF AUREOMYCIN*

J. C. Olson, Jr., D. S. Willoughby, E. L. Thomas, and H. A. Morris

Department of Dairy Husbandry
University of Minnesota
St. Paul, Minn.

In studies of the keeping quality of pasteurized milk, it was found that past records from milk plants showing good bacterial counts of finished products, afforded a rather reliable indication that milk from such plants may show better keeping quality than milk from plants with poor past records. Proper pasteurization resulted in extensive if not complete destruction of psychrophiles. Negative coliform counts of freshly pasteurized milk were not reliable as indicators of good keeping quality during storage at the temperature used in these studies. The mere absence of psychrophiles in one or two milliliters of milk was not found to be a guarantee of long storage life. The presence of aureomycin in the concentration used in these studies had no effect in extending the keeping quality of pasteurized milk.

At least three trends within the market milk industry have accentuated the importance of factors influencing the storage life or keeping quality of unfrozen fresh pasteurized milk. These trends are, (1) the lengthening of the time between processing and wholesale or retail delivery of milk, (2) the increase in volume of milk distributed over wide areas from centralized processing plants, and (3) the extensive interstate traffic in fresh pasteurized milk which often involves several days of transport.

Organoleptic Defects

One of the major factors which influences the keeping quality of pasteurized milk is the metabolic activity of bacterial species which are capable of relatively rapid growth in milk at low temperatures, generally within the range of 35° to 45° F. The descriptive noun "psychrophile" is commonly used to designate such a bacterial group. The influence of this group of bacteria on the flavor of milk kept under refrigeration does not manifest itself usually until after three or four days of storage and often not until a considerably longer period has elapsed. In fact, it is not uncommon to find commercially pasteurized milk which has excellent keeping quality for seven to ten days of storage. Sooner or later, however, all commercially processed milk held at temperatures within a few degrees above freezing will show a flavor defect due to the metabolic products produced as a result of bacterial proliferation. The period of storage required for this will vary depending upon the species present and their level of population in the milk at the time the finished product emerged from the bottle-capping machine. A large variety of flavor defects may be attributed to the growth of psychrophiles in milk. Some of the more common of these are unclean, putrid, fruity, and an unclean sour flavor. Changes in the body or appearance of milk often may be observed as a result of the growth of these bacteria. At times a thickening may occur which is often associated with a ropy or stringy condition. Quite often a slight green or yellow coloration may be observed usually near the surface edge. These body and color defects occur almost invariably after the flavor defects have become pronounced; so much so that there is little likelihood of the product being acceptable. At this point it might be well to mention that fluid milk products are not the only milk products subject to deterioration by psychrophilic bacteria. Flavor defects in butter, cheese, and other concentrated products often are caused by members of this group.

A number of questions arise relative to the flavor deterioration of fluid milk through the activity of psychrophilic bacteria. Some may be answered with dispatch; the answers to others must await gathering of more knowledge.

Occurrence in Raw Milk

The first question which logically might be asked is: to what extent are psychrophiles found in fresh raw milk supplies? In answer to this the literature reveals that all who have sought to find these bacteria in raw milk have succeeded, particularly if their analytical procedure included incubation of poured plates for a sufficient period of time within a temperature range of 5°-10° C. The numbers which have been reported by various investigators have varied greatly, some being in excess of 100,000 per milliliter. Such being the case, one immediately may ask whether exposure to the minimum time-temperature relationships for pasteurization of milk will destroy

Dr. Olson's early youth was spent on the farm in Iowa and Minnesota. He received the B.S. degree in dairy products, the M.S. degree in dairy bacteriology, and the Ph.D. degree in bacteriology, all from the University of Minnesota. During World War II his principal assignment was in the production of typhoid vaccine at the U.S. Army Medical Department Laboratory in Lansing, Michigan, where he was in charge of production. Since 1948 he has been in charge of the Bacteriology Section, Department of Dairy Husbandry, University of Minnesota.

*Presented at the Thirty-ninth Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., Minneapolis, Minnesota, October 20, 1952.

Scientific Journal Series Paper No. 2959, Minnesota Agricultural Experiment Station.

The authors acknowledge funds for research contributed by the Twin City Quality Control Committee.

TABLE 1—BACTERIAL COUNTS OF MIXED HERD MILK BEFORE AND AFTER LABORATORY PASTEURIZATION (143°F—30 MINUTES) BY SEALED-TUBE, TOTAL-IMMERSION TECHNIQUE.

Trial	SPC (32°C.)*	SPC(35°C.)	Coliform count	Psychrophile count (7°C.)
1. Raw	730,000	630,000	18,000	200,000
1. Pasteurized	.....	.....	.....	0
2. Raw	710,000	830,000	22,000	130,000
2. Pasteurized	9,100	.....	.....	0
3. Raw	>3,000,000	370,000	8,000	152,000
3. Pasteurized	>30,000	>30,000	0	0
4. Raw	1,600,000	1,600,000	890,000	680,000
4. Pasteurized	8,400	4,400	.....	0
5. Raw	360,000	480,000	5,400	62,000
5. Pasteurized	330,000	110,000	0	0

*SPC = Standard plate count.

psychrophilic bacteria.

EFFECT OF PASTEURIZATION

The heat resistance of this group of bacteria or even representative species of the group has not been studied precisely. However, a number of investigators have subjected milk inoculated with pure cultures of psychrophiles to laboratory pasteurization and have sought to detect their presence in the pasteurized. product. The results reveal some difference of opinion. For example, Kennedy and Weiser[3] reported that all but one of fifteen pure cultures survived 145°F. for 30 minutes and did so in considerable numbers. On the other hand, only six of 41 cultures of psychrophilic bacteria isolated from fresh butter and studied by Jezeski and Macy[2] survived laboratory pasteurization at 150° F. for 30 minutes. In a more extensive study, Erdman and Thornton[1] observed that only four of 722 psychrophilic cultures survived laboratory pasteurization, presumably at 145° F. for 30 minutes. Watrous, Doan, and Josephson[5] subjected 35 psychrophilic cultures to laboratory pasteurization at 62.8° C. for 30 minutes and none were found to survive.

Recent studies reported by Rogick and Burgwald[4] on the effect of commercially applied low-temperature-holding and high-temperature-short-time pasteurization processes on the destruction of psychrophiles showed quite conclusively that when samples drawn aseptically from the units were analyzed, both processes resulted in destruction of this group at least to the extent that they were not detected in 4.1 milliliter quantities of the freshly pasteurized product. Psychrophiles were found after storage of these same samples for seven days at 4°-7°C., but judging from the counts reported, had not reached sufficient populations to result in flavor deterioration during that period of storage. When samples drawn as finished products were analyzed, psychrophiles were found in 21 of the 30 samples. Similar results were obtained by Watrous, Doan, and Josephson[5]. These investigators studied the effect of both laboratory pasteurization and the commercial low-temperature-holding process on the destruction of psychrophiles. Their results were even more conclusive. All psychrophile counts obtained from a series of 75 samples immediately after laboratory pasteurization and again after 10 and 20 days of storage at 5° C were less than one per milliliter. No evidence of psychrophilic bacteria was found in any sample of pasteurized milk drawn aseptically from the holding vat either when analyzed immediately or after 15 days of storage at 5° C. These same investigators as well as others observed extensive growth of psychrophiles in samples obtained as finished products. In such products, when fresh, the extent of their presence has been shown to vary among samples of the same lot and among samples from different plants.

Results shown in tables 1 and 2 which are representative of those obtained in our laboratories concurrently with those referred to above, can only add to the literature which shows quite conclusively that proper pasteurization as commonly practiced destroys the psychrophilic bacteria present in raw milk, at least to the extent that they would not be a factor in flavor deterioration over an extended storage period. The data presented in table 1 are representative of those obtained before and after laboratory pasteurization (143° F.—30 minutes) of samples of mixed herd milk. Psy-

chrophile counts were obtained by incubating plates at 7°C. for ten days. At no time have we recovered psychrophiles after laboratory pasteurization of milk by the sealed-tube, total-immersion technique. Similar results obtained from samples drawn aseptically from a point between the flow division valve and the regeneration section of the high-temperature, short-time pasteurizer are shown in table 2. The pasteurizer was operating at 162°F. with a holding time of 16 seconds. Data obtained from fresh samples, and after 3, 4, 5, and 7 days of storage, are presented. Also, a series of results obtained from the analysis of the bottled product is shown.

From the experimental work which has been done in our laboratories and elsewhere on the psychrophile problem as it relates to the keeping quality of milk, one may conclude that proper pasteurization is effective in the destruction of this group.

OCCURRENCE IN PASTEURIZED MILK

The answer to the next logical question, "What then is the source of these bacteria in pasteurized milk and how may they be controlled?", becomes obvious. The fact that psychrophiles are commonly found in freshly pasteurized milk indicates almost unquestionably that they have been introduced at one or more points during post-pasteurization handling of the product. This points directly to the lack of effective cleaning and/or bactericidal treatment of all equipment surfaces involved from the pasteurizer on through the bottling and capping operations.

The effectiveness with which the cleaning and sanitizing procedures are carried out in milk plants varies greatly. This is evident from the results of physical inspections, as well as the results of coliform counts, swab counts, and other laboratory tests on "line run" samples and finished products. The coliform count has occupied an important place among the procedures which are valuable in detecting post-pasteurization contamination.

At this point the question may arise as to the value of standard plate counts, coliform counts, and psychrophile counts on fresh products as indicators of keeping quality. This is of practical importance, for the plant superintendent is ever alert to information on probable storage life at low temperature of products being turned out under his supervision.

In our studies we have concerned ourselves to some extent with this aspect of the problem. To begin with we wished to learn what relationship existed between the past records of bacterial counts of finished products from a milk plant and the keeping quality of products from the same plant when stored at low temperature. Fortunately in the Minneapolis and St. Paul milk shed, a rather extensive quality control program is in operation. Past records of laboratory results from all products distributed by each plant were available. Through an examination of these records, plants could be placed in various categories. Having done this, an attempt was made to determine the current situation with re-

TABLE 2—BACTERIAL COUNTS OF PASTEURIZED MILK, (1) DRAWN ASEPTICALLY FROM HTST PASTEURIZER, AND (2) OBTAINED AS FINISHED BOTTLED PRODUCT.

Bacterial counts after storage at 45° F for time indicated.	From HTST pasteurizer		Bottle of finished product		
	Sample 1	Sample 2	Bottle 1	Bottle 2	Bottle 3
0 days—fresh sample					
SPC* (32°C.)	11,000	12,000	10,000	11,000	.....
Coliform count	0	0	2	8	.....
Psychrophile count.	0	0	26	40	.....
3 days					
SPC* (32°C.)	11,000	11,000	9,200	13,000	.....
Coliform count	0	0	2	3	.....
Psychrophile count.	1	1	45	90	.....
4 days					
SPC* (32°C.)	8,900	11,000	9,400	12,000	.....
Coliform count	0	0	0	2	.....
Psychrophile count.	0	0	49	300	.....
5 days					
SPC* (32°C.)	9,200	12,000	140,000	6,100,000	.....
Coliform count	0	0	0	2	.....
Psychrophile count.	2	1	2,800	2,400	.....
7 days					
SPC* (32°C.)	9,700	10,000	6,700,000	4,700,000	2,100,000
Coliform count	0	0	5	6	0
Psychrophile count.	3	0	9,600,000	2,100,000	2,000,000

* SPC = Standard plate count.

TABLE 3—BACTERIAL AND FLAVOR CHANGES DURING STORAGE* OF HOMOGENIZED PASTEURIZED MILK, WITH AND WITHOUT ADDED AUREOMYCIN, FROM PLANT A

No. of days Storage	Sample No.	S.P.C.** (35°C.) Without aureomycin	S.P.C.** (35°C.) With aureomycin	Coliform count Without aureomycin	Coliform count With aureomycin	Psychrophile count*** Without aureomycin	Psychrophile count*** With aureomycin	Flavor score and comments**** Without aureomycin	Flavor score and comments**** With aureomycin
0	1	15,000	.....	0	.....	810	.....	36 fe;sl,uc	37 fe
0	2	15,000	.....	0	.....	660	.....	37 fe	35.5 fe;uc
0	3	19,000	.....	0	.....	35,000	.....	37 fe;sl,uc	37 fe;sl,uc
0	4	34,000	.....	0	.....	46,000	.....	37 fe;sl,uc	37 fe;sl,uc
0	5	9,500	.....	2	.....	160	.....	36 ox;sl,fe	37 sl,ox;sl,fe
0	6	16,000	.....	1	.....	410	.....	35.5 sl,ox;fe	35.5 sl,ox;fe
4	1	5,100,000	12,000,000	7,200	170,000	17,000,000	18,000,000	34 malty	35 fe;uc
4	2	6,100,000	3,600,000	34,000	28,000	25,000,000	12,000,000	34 malty	35 fe;uc
4	3	60,000,000	20,000,000	110,000	140,000	87,000,000	37,000,000	28 malty	30 fe;uc
4	4	54,000,000	6,000,000	14,000	3,600	140,000,000	13,000,000	28 malty	32 fe;uc
4	5	13,000,000	620,000	11,000	1,900	40,000,000	33,000,000	32 cowy;uc	33 sl,fr;uc
4	6	17,000,000	1,000,000	39,000	66,000	33,000,000	36,000,000	30 uc	32 fr; uc
7	1	140,000,000	130,000,000	360,000	430,000	200,000,000	210,000,000	0 ferm;malty	0 ferm;fr
7	2	120,000,000	110,000,000	41,000	21,000,000	190,000,000	250,000,000	0 ferm;fr	0 ferm;fr
7	3	200,000,000	5,800,000	87,000	870,000	540,000,000	36,000,000	0 ferm;fr	0 ferm;fr
7	4	140,000,000	82,000,000	190,000	41,000	350,000,000	140,000,000	0 malty	0 ferm
7	5	44,000,000	7,800,000	41,000	45,000	240,000,000	61,000,000	0 putrid	0 putrid
7	6	60,000,000	11,000,000	61,000	60,000	440,000,000	490,000,000	0 uc;fr	0 uc;fr

* Storage was at 45° F.
** Standard plate count
*** Incubation of plates at 45° F. for 10 days.

**** ast=astringent; fe=feed; ferm=fermented; fr=fruity; h=heat; ox=oxidized; sl=slight; uc=unclean.
Flavor scores were assigned in accordance with the U. S. Department of Agriculture score card for milk and cream.

spect to both bacterial counts and keeping quality of milk from several of these plants.

Samples from two plants, A and B, were obtained over a period of several weeks. Only one sample was obtained from each of five additional plants. Products from plant A had a rather long record of sporadically high standard plate counts and generally high coliform counts. The record of Plant B showed low standard plate counts and almost complete absence of coliform bacteria in two milliliter quantities of all finished products. Both plants were approximately the same size and used similar methods of processing. Both used a high-temperature-short-time pasteurizer. Samples were drawn as finished products either at the beginning or at about the middle of the filling operation. Each sample consisted of four one-quart bottles of homogenized, pasteurized milk packaged either in glass or paper containers. These were pooled in the laboratory and stored at 45°F.

The data obtained from the examination of samples from Plant A are presented in table 3. Data obtained on the effect of added aureomycin on keeping quality also are included in table 3. These data will be discussed later. All samples are grouped according to days of storage. It may be observed that the initial standard plate counts, i.e. at zero days of storage, are within the 30,000 per ml maximum for Grade A milk, but are somewhat higher than might be expected. Coliform bacteria either were not detected or were low in number. Psychrophile counts were high in four samples and extremely high in the other two. Flavor scores were in the fair to good range with a feed flavor common to all samples. After four days of storage standard plate counts had increased greatly, but in every instance were exceeded by the psychrophile counts. Coliform counts had increased somewhat, very likely playing no role in the deterioration of flavor. After seven days of storage, bacterial counts showed further increases and were accompanied by flavor deterioration to the point of zero score.

The data obtained from samples from Plant B are presented in table 4. The counts for the fresh samples were quite satisfactory. After four days of storgage at 45°F. the data obtained appear quite different from those obtained from milk processed at Plant A. Psychrophile counts were obtained after this period but still were of relatively low magnitude. After seven days of storage, bacterial counts had not reached sufficient levels, with the exception of samples 7 and 8, to cause any appreciable reduction in flavor score. This was undoubted-

ly due to the very low initial population of types capable of rapid growth at 45°F. While past records including physical inspections and laboratory results for Plant B were excellent, nevertheless the data obtained from samples 7 and 8 reveal the fact that occasional lapses in the clean-up operation occur even in the best of regulated plants. The maintenance of good keeping quality through the control of psychrophiles requires an unrelenting vigilance with respect to the sanitation of post-pasteurization equipment.

In table 5 the data obtained from samples from Plants C, D, E, F, and G are presented. Past records for Plants C, F, and G were good, for D fair, and for E the record was poor, being similar to that of Plant A.

It is evident that considerable difference exists between plants with respect to the psychrophile problem. It appears significant that samples from three of the four plants, (B, C, and F) with the exception of two samples from Plant B, whose past bacterial records were good showed no detectable flavor deterioration after seven days of storage. This would indicate that one might expect to obtain milk having good keeping quality from plants which can show past records of satisfactory bacterial counts on finished products.

From the data presented it may be observed that an initial psychrophile count is not a good indication of the keeping quality of a product. The data for samples 7 and 8 from Plant A and those for Plants D and G support this contention. In these instances the initial psychrophile counts were negative or very low, yet they were high at subsequent examination periods; also marked flavor deterioration occurred.

An interesting observation may be made from the psychrophile counts of the sample from Plant F. In this instance extensive growth occurred with no concurrent detectable flavor deterioration; an example of relatively inert bacterial activity with respect to flavor.

It seems apparent from the data presented as well as from those reported by others that the standard plate count was worthless in predicting keeping quality. On the other hand the presence of coliform bacteria, even in small number in the fresh product, was associated with poor keeping quality. It appears, however, that a negative coliform count on a finished product could not be depended upon to indicate that such a product would have a long storage life free from flavor deterioration due to psychrophiles. It should be empha-

TABLE 4—BACTERIAL AND FLAVOR CHANGES DURING STORAGE* OF HOMOGENIZED PASTEURIZED MILK, FROM PLANT B

No. of days storage	Sample No.	S.P.C.** 32°C.	S.P.C.** 35°C	Coliform count	Psychropile*** count	Flavor score and comments****
0	1	7,100	7,200	0	2	37 fe
0	2	8,800	8,500	0	2	37 fe
0	3	6,800	6,500	0	0	37 fe
0	4	2,800	2,800	2	0	37 fe
0	5	4,700	3,800	1	0	37 fe
0	6	3,900	4,000	0	0	37 fe
0	7	5,800	4,600	1	0	37 fe;sl,cowy
0	8	11,000	14,000	0	0	37 fe;sl,cowy
4	1	34,000	66,000	0	6,200	36 fe;sl,uc
4	2	93,000	140,000	0	5,600	37 fe
4	3	35,000	44,000	1	0	36.5 fe;sl,cowy
4	4	47,000	66,000	0	0	37 fe
4	5	10,000	11,000	8	10,000	37 fe
4	6	3,700	4,000	0	300	37 fe
4	7	200,000	210,000	13	51,000	37 fe;sl,cowy
4	8	34,000	39,000	5	6,700	37 sl,cowy
7	1	690,000	820,000	0	800,000	36 fe;sl,uc
7	2	1,300,000	1,300,000	0	920,000	37 fe
7	3	150,000	170,000	8	960,000	36 fe;sl,cowy
7	4	160,000	170,000	1	250,000	36 fe;sl,cowy
7	5	.....	120,000	2	240,000	37 fe
7	6	.....	120,000	0	140,000	37 fe
7	7	27,000,000	28,000,000	710	48,000,000	0 high acid
7	8	11,000,000	9,800,000	130	22,000,000	0 high acid

*Storage was at 45° F.
**Standard Plate Count
***Incubation of plates at 45° F. for 10 days.
****See Table 3

TABLE 5—BACTERIAL AND FLAVOR CHANGES DURING STORAGE* OF HOMOGENIZED PASTEURIZED MILK FROM PLANTS C, D, E, F, AND G.

Plant	No. days storage	S.P.C.** 32°C	S.P.C.** 35°C	Coliform count	Psychropile*** count	Flavor score and comments****
C	0	2,900	4,400	0	0	38 sl,fe
	3	2,000	3,400	0	23	38 sl,fe
	4	2,700	6,300	0	1,200	38 sl,fe
	5	4,500	6,500	11	3,300	38 sl,fe
	7	24,000	32,000	74	680,000	36 sl,uc
D	0	7,600	5,900	0	4	38 sl,uc
	3	790	660	0	530	38 sl,uc
	4	59,000	61,000	1	19,000	36 sl,uc
	5	470,000	320,000	8	390,000	36 sl,uc
	7	580,000	420,000	1,400	78,000,000	0 uc
E	0	8,200	6,800	30	9,000	36 sl,uc
	3	160,000	160,000	200	900,000	36 sl,uc
	4	1,200,00	1,400,000	460	1,100,000	32 sl,uc;ox
	5	2,500,000	2,800,000	2,900	37,000,000	0 uc
	7	44,000,000	26,000,000	4,600,000	130,000,000	0 uc
F	0	3,500	3,600	0	1	38h;sl,fe
	3	3,300	3,500	0	.....	38h;sl,fe
	4	60,000	44,000	0	5,200	38h;sl,fe
	5	87,000	89,000	0	280,000	38h;sl,fe
	7	240,000	430,000	0	26,000,000	38h;sl,fe
G	0	24,000	21,000	0	0	38 sl,fe;sl, ast
	3	17,000	17,000	0	.....	38 sl,fe;sl, ast
	4	18,000	16,000	1	6	35 sl,uc
	5	31,000	22,000	0	2,800	35 sl,uc
	7	480,000	390,000	0	7,100,000	0 ox;uc

*Storage was at 45° F.
**Standard Plate Count
***Incubation of plates at 45° F. for 10 days.
****See Table 3

sized that pasteurized milk must be extremely low in psychrophile population in order to assure good keeping quality. Such population levels must be considerably less than mere absence in one or two milliliters of fresh product.

EFFECT OF ANTIBIOTICS

Antibiotics must be considered in relation to the keeping quality problem. The use of antibiotics in the treatment of mastitis has had, of course, its impact upon the manufacture of cheese and cultured milks. In addition it has been said that in certain areas of the country, milk contains antibiotics in sufficient concentration to prolong abnormally the keeping quality of pasteurized milk and perhaps even inhibit bacterial growth entirely. Data presented in table 3 were obtained during the course of a study to determine the effect of aureomycin on the keeping quality of pasteurized milk. Each sample from plant A was divided. To one lot, crystalline aureomycin was added to give a concentration of 0.2 microgram per milliliter of milk. Opinions and calculations of other investigators would lead one to believe that such a concentration might occur in pasteurized milk. Actually this concentration is slightly below that reported for complete inhibition of *Streptococcus lactis*.

The data presented in table 3 indicate generally lower counts for samples containing aureomycin. The differences are not great however. The flavor criticisms after four days of storage show that marked deterioration had taken place even when aureomycin had been added. The "malty" flavor observed in samples not containing antibiotic and the absence of this flavor in milk to which aureomycin had been added, provides evidence which indicates that suppression of the bacterial species responsible for this defect had occurred. The inhibition of this species, presumably *Streptococcus lactis* var. *maltigenes*, was nullified by the growth of other types which resulted in deterioration of flavor to the same extent as that which occurred in milk containing no antibiotic. After seven days of storage

bacterial counts showed further increases accompanied by flavor deterioration to the point of zero score.

SUMMARY

In summary the evidence to date would indicate the following:

1. One may expect to find psychrophilic bacteria in raw milk supplies, and extensive proliferation of these bacteria will inevitably occur if such milk is held at low temperature.

2. Proper pasteurization as commonly carried out will result in extensive if not complete destruction of psychrophiles.

3. Proper cleaning and bactericidal treatment of all post-pasteurization equipment, including bottles, is essential to prevent the contamination of pasteurized milk with psychrophilic bacteria.

4. Standard plate counts, and coliform counts of freshly pasteurized milk as routinely performed are not good indicators of keeping quality.

5. A psychrophile count on fresh milk is not a good indicator of keeping quality unless a considerably larger quantity of milk than normally used is examined. The mere absence of psychrophiles in one or two milliliters of milk is not a guarantee of long storage life.

6. Individual plants vary greatly with respect to the presence of psychrophiles in their products and the keeping quality of their products.

7. Good past bacterial count records afford a rather reliable indication that products from such plants may show better keeping quality than products from plants with poor past records.

8. The concentration of aureomycin used in this study had no effect in extending the keeping quality of pasteurized milk.

9. The psychrophile problem as it relates to the keeping quality of pasteurized milk is a plant problem, and more specifically it appears to be a post-pasteurization sanitation problem.

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Changes in Oakite Management Organization

Following a recent meeting of the board of directors of Oakite Products, Inc , manufactures of industrial cleaning and allied materials, three changes in the management organization were announced. J. J. Basch, former Philadelphia division manager and veteran of 28 years service with the company, was appointed manager of research and product development. He will be in charge of the company's expanding technical research program, and will supervise the field testing of new and experimental materials. A member of the company's boar dof directors since 1948, he has also been elected a member of its executive committee. At the same meeting, E. H. Steif, general attorney of the company and member of the Oakite organization since 1948, was appointed assistant secretary and elected to the board of directors. Another appointment announced was that of W. A. Baltzell, former southern division manager and with the company since 1941. as assistant sales manager. He will assist the general sales manager of the company's industrial division in connection with sales management functions.

The new appointments, a company spokesman states, are designed to add to the managing and operating strength of the company, and to assist it in meeting with maximum effectiveness the increasing demands made upon its facilities by all branches of industry.

Canco's Dr. Clark Named to NRC Food, Nutrition Board

Dr. Berton S. Clark, scientific director of the American Can Company, has been appointed a member of the Food and Nutrition Board of the National Research Council.

Members of the board, which is responsible for the "translation of nutritional science to the public welfare," are selected primarily for their leadership in an dknowledge of the food industry. Dr. Clark, a leader in research on food processing and preservation, als ois chairman of the research council's committee on packing, packaging and preservation and a member of the council's advisory boar don quartermaster research and development.

The Canco scientific directory recently became president of the Institute of Food Technologists.

ANDREW J. KROG RETIRES FROM LILY-TULIP CUP CORP.

Andrew J. Krog, who last year celebrated his twenty-fifth anniversary in the field of public health, is retiring from Lily-Tulip Cup Corporation it was announced by Fen K. Doscher, Vice President in charge of sales.

Mr. Krog became head of Lily's public health department in 1947 after spending twenty years as a health officer.

After doing some extensive traveling both here and abroad, Mr. Krog plans to settle in Daytona Beach, Florida, where he will seriously take up his favorite hobby of fishing.

COLORADO DAIRY PRODUCTS ASSOCIATION ANNOUNCES APPOINTMENT

Kenneth W. Bowman has been appointed Executive Secretary of the Colorado Dairy Products Association, according to True Adams, President of the Association. Mr. Bowman makes his home in Boulder, is married, and has two children. He received his education at the State University of Iowa, having fifteen years association with the dairy industry in the supply field, giving his an understanding of all phases of dairy operations. Mr. Bowman will assume the duties of executive secretary on July 1st.

ACIDS AND CHLORAMPHENICOL AS SANITIZING AGENTS FOR MEAT CONTAMINATED WITH FOOD POISONING ORGANISMS.[1]

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INTRODUCTION

Food poisoning due to staphylococci is considered to comprise about 90 percent of all food poisoning cases in North America. However, as Dolman[9] points out, food poisoning outbreaks are notorious for the unreliability of the statistics respecting their incidence.

Inasmuch as many countries do not possess cheap and readily available electricity and refrigerating equipment, the incidence of food poisoning should be higher, especially in tropical regions where the temperature is nearer to the optimum for food poisoning bacteria all the year round, than it is in this country. Many countries in the Far East usually have the meat slaughtered early in the day and sold as fresh meat up to 24 hours for beef, and during a shorter time for pork, depending on the season of the year. Consequently, much sickness undoubtedly is due to consumption of contaminated meat.

As will be pointed out later, market meat and meat products in the United States are by no means free of food poisoning bacteria such as salmonellae, and, naturally, staphylococci which are ubiquitous. Furthermore a certain amount of meat is consumed which has not been inspected by a trained veterinarian, and also wild game which can not be immediately refrigerated.

It was the purpose of this investigation to determine the viability of some food poisoning staphylococci and salmonellae on the surface of beef and pork at different temperatures, and also to study the influence of treating the surface of the meat with certain common germicides; to demonstrate the influence of refrigerating meats at various temperature ranges; and also to demonstrate the effects of various agents on the numbers of viable bacteria on contaminated meat.

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[3]Professor of Bacteriology and Public Health.

LITERATURE REVIEW

There is ample evidence in the literature that beef and pork harbor staphylococci and salmonellae, especially the latter. Dack[8] reported that 47.9 percent of the hogs slaughtered for the market harbored *Salmonella*. Cherry *et al.*[6] examined 250 samples of retail market meats and found *Salmonella* in 5.2 percent of them. They found more in pork than in beef. Likewise eggs, milk, poultry, and many kinds of prepared foods such as pastry, gravies, sauces, and the like have been shown to be the cause of food poisoning.

The two most important factors which influence the development of bacteria on the surface of meat are temperature and humidity. According to Ewell[8] bacterial growth ceases at relative humidities below 92 percent and is best at the highest attainable humidity of 99 percent. However, some growth was observed at a relative humidity of 70 percent in still air.

The amount of moisture present in meat is important from the standpoint of spoilage and disease. It is generally recognized that the moisture content should be below 10 percent to prevent spoilage at normal temperatures. Segalove and Dack[28] found that growth of food poisoning strains of staphylococci isolated from food poisoning outbreaks was not evident in samples of dehydrated meat containing 20 percent moisture or less.

Temperature is equally as important as moisture for bacterial development. Jensen[19] emphasized the importance of not holding food for longer than 4 to 8 hours between 50 and 120°F. Haines[15] found that lean beef held at temperatures of 32.0°F had an average bacterial count of 40,000 per sq. ml. of surface area. Wright[36], working with fresh and frozen lamb, found little difference between the two from the standpoint of bacterial content.

Choomphorn Gomutputra was graduated from the College of Veterinary Science, University of the Phillipines in 1944. He then returned to Thailand where he worked in the Army Veterinary Hospital until 1949. He won a competitive Army scholarship for advanced study in veterinary science and food bacteriology and chose to study in the United States.

He was graduated from Michigan State College with a Master of Science degree in Veterinary Surgery and Medicine in September 1950 and with a Ph. D. degree in Food Bacteriology in June 1952. He spent the summer of 1952 in Europe in practical study and observation after which he returned to Thailand. Presently he is a Major in the Veterinary Corps and is stationed in the Quartermaster Headquarters in charge of laboratory control and research work for provisions for the Thailand Army.

Fitzgerald[12] noted that frozen foods were remarkably free of enterotoxic food poisoning bacteria and infectious disease organisms. The many references found in the literature support those given here to the effect that temperature plays an important role in the growth of bacteria in foods.

The acidity of foods is another important consideration from the standpoint of spoilage and disease. Few if any putrefactive or pathogenic bacteria grow below pH 4.5. *Clostridium botulinum* is found predominantly in the less acid foods. Segalove and Dack[27] found growth of a food poisoning strain of *Staphylococcus aureus* to be best in low acid and semi-acid foods and

no growth in high acid foods. Growth was better at 71.6°F (22° C) than at 98.6°F (37° C). Haynes and Hucker[16] in their review of the literature on *Micrococcus* entero toxin food poisoning compiled a long list of foods in which staphylococci food poisoning had occurred and concluded that almost any article of food not properly prepared and refrigerated may cause food poisoning.

That the acidity plays an important role is shown by Wethington and Fabian[35] who found that in samples of mayonnaise, testing from pH 3.8 to 4.0, the survival time for several strains of food-poisoning staphylococci ranged from 72 to 96 hours and for salmonellae from 1 to 18 hours. Porter[25] stated that the minimum pH of the salmonellae varies with the strain, the lowest being pH 4.5 for *Salmonella paratyphi*. Hucker and Haynes[17] found that the addition of 0.15 percent acetic acid to veal broth greatly reduced food poisoning staphylococci in 48 hours, and the addition of 0.2 to 0.3 percent acetic acid practically eliminated them in 7 days. Nunheimer and Fabian[24] and Levine and Fellers[21] found acetic acid to be very effective in controlling food poisoning staphylococci and spoilage bacteria respectively. Likewise other acids such as chloroacetic [11] and dehydroacetic[29, 30, 32] have been used as mycostatic agents on fruits, vegetables, bread, and dairy products.

The addition of citric acid to vanilla filling in sufficient amounts to lower the pH to 3.43 to 3.65 proved effective in checking the growth of S. *aureus*. Lac tic acid, when used in the place of citric acid, produced a better tasting cheese cake filling and effectively retarded the growth of S. *aureus* at pH values between 4.42 and 4.67[3].

Antibiotics such as chloramphenicol (chloromycetin), aureomycin, and terramycin have been studied in connection with the control of the microflora on meat. Goldberg *et al.*[13] added these antibiotics in concentrations ranging from 0.5 to 2 ppm to beef and found that 90 percent of the microflora found on beef were susceptible to them. McLean *et al.*[22] found that chloramphenicol inhibited many species of *Salmonellae in vitro* at 2.5 mg/ml and resistant strains at 5.0 mg/ml in culture medium and *Staphylococcus* in concentrations ranging from 2.5 to 10.0 mg/ml.

Cooking, unless properly done for a sufficiently long time, gives a false sense of security against pathogenic bacteria in foods and toxigenic food poisoning. *Salmonella typhimurium* and *Salmonella enteritidis* inoculated into duck eggs could be recovered after the eggs had been immersed in boiling water for up to 13 minutes[5]. Rettger *et al.*[26] found that soft boiling, coddling, and frying on one side only do not necessarily render the yolks of infected eggs free from viable S. *pullorum*.

Stafseth *et al.*[31] found that some species of salmonellae could survive in eggs stored at 25°C over a period of 12 months. They also stated that by ordinary methods of cooking—boiling, frying, poaching, and scrambling—S. *pullorum*, frequently an inhabitant of eggs, was not always destroyed. They recommended scrambled or four-minute boiled eggs as the safest.

An investigation by Hussemann and Wallace[18] revealed that currently accepted methods of broiling or roasting markedly reduce the number of *Salmonella* present in chicken muscle or liver, but do not render a chicken free from the organism.

Other food constituents in the concentrations usually found in food or added to them as seasonings such as sugar, salt, and spices have little or no effect upon food-poisoning bacteria. For example Dack[7] noted that staphylococci grow abundantly in concentrations of salt and sugar, such as those in certain cured meats which prevent other types from growing. Nunheimer and Fabian[24] showed that food-poisoning staphylococci were not inhibited by salt up to 15 to 17.5 percent but were killed at 20 percent; dextrose required 30 to 35 to inhibit and 40 to 50 percent to be germicidal while sucrose required 50 to 60 percent to inhibit and 60 to 70 percent to be germicidal to staphylococci. Certain spices such as mustard, cassia, cinnamon, and cloves do have a germicidal action, according to Blum and Fabian[1], in concentrations ranging from 0.1 to 1.0 percent, which concentrations are considerably greater than is ordinarily found in foods.

From this *brief* survey of the literature it is evident that the best way to control food-poisoning outbreaks is by controlling the temperature, humidity, and acidity of the food insofar as possible and to handle it rapidly. These precautions become all the more imperative since the enterotoxin of food-poisoning staphylococci is very stable to most physical and chemical agents.

EXPERIMENTAL

Test organisms. Three strains of food poisoning staphylococcus, numbered 172, 178, and 196 were used in this investigation. The original cultures had been obtained from Dr. G. M. Dack, Food Research Institute, University of Chicago. These organisms had been isolated previously from chipped beef and two different samples of ham, and their toxicity had been proved several times by the use of monkeys.

Eight species of test salmonellae were obtained from our stock cultures. The organisms had been tested and found to possess the usual characteristics of the species. The organisms were *Salmonella choleraesuis* (var. Kunzendorf), *Salmonella paratyphi, Salmonella enteritidis, Salmonella gallinarum, Salmonella schottmülleri, Salmonella typhimurium, Salmonella pullorum*, and *Salmonella typhosa*.

A series of trials proved that Difco Chapman-Stone medium is very suitable for differential counting of staphylococci, especially the usual food poisoning type, although others often produce the same Stone reaction—a clear halo around the colonies. The surface colonies are distinct and separate when plating is properly carried out. Since the *Salmonella* species used were found to grow on Difco Salmonella Shigella Agar (S. S. Agar), this medium was very satisfactory for differential counts after the organism had grown on the meat for a period of time. A surface plating method was developed for these two media which produced uniformity as well as differentiation and separation in size of colonies. The method briefly was to pour 25 to 30 ml quantities of the medium into Petri plates and dry the poured plates for 24 hrs. at 37°C and at room temperature for another 48 hours before use. One-tenth ml of the properly diluted material was delivered on the

surface of the plate and quickly spread over the surface by means of special spreading wire made so as not to gouge the surface of the medium on the plate.

Since the swabbing method[23] showed after repeated trials that it was unreliable because of the wide variations in results, another method was used which produced more reliable and reproducible results. The method consisted of dropping the pieces of meat into dilution bottles containing 10 or 100 ml of distilled water, shaking them 50 times after which suitable dilutions were made and plated from the original dilution bottles.

In order to obtain comparative counts in plating blocks of lean beef and pork, about 5 grams was taken from the same retail cuts and prepared as follows: (a) Lean pieces of raw meat cut aseptically from 1 cm under the surface were designated as "deep lean meat." (b) Lean pieces of raw meat cut aseptically from the surface of retail cuts, were designated as "lean meat." (c) Lean pieces of meat, cut 1 cm beneath the surface and autoclaved at 15 pounds pressure for 15 minutes to destroy all spores present were designated as "autoclaved lean meat." The above pieces of meat were inoculated with 24-hour nutrient broth cultures of the food poisoning organisms and left covered in Petri dishes at 21.1-26.7°C (70-80°F) for 24 hours before plating, in order to compare the amount of growth on them.

To compare the influence of temperature, other pieces of deep lean meat, (taken at the same time from the same chunk of meat as the above deep lean meat pieces), were also placed in Petri dishes and each inoculated with a loopful of the respective food poisoning organisms as above. They were incubated for 24 hours at different temperature ranges before plating The approximate number of the different organisms in a loopful was determined by plating. These numbers were used as the starting points in plotting the graphs in figures 3, 4, 5, and 6. Uninoculated pieces of meat were used as controls and were incubated at the different temperature ranges for 24 hours before plating for staphylococci and salmonella. Control pieces of fresh deep lean meat were also plated immediately

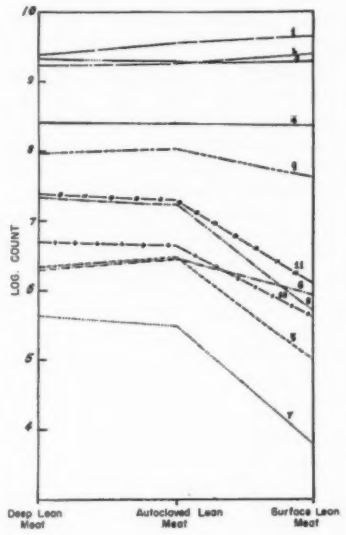

Fig. 1. Growth of Food Poisoning Organisms on Beef at 23.9±2.8°C.

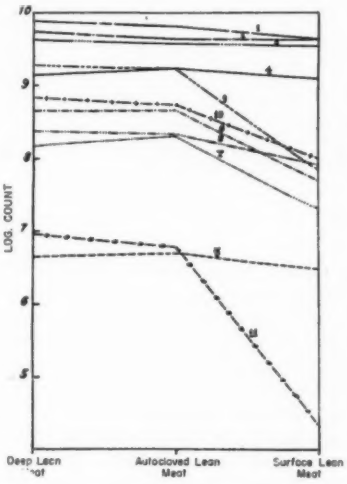

Fig. 2. Growth of Food Poisoning Organisms on Pork at 23.9±2.8°C.

to determine total numbers of bacteria by using tryptone-glucose-yeast-extract agar.

Temperature ranges used for incubating the different pieces of meat were 4.4-10.0°C (40-50°F), 10.0-15.6°C (50-60°F), 15.6-21.1°C (60-70°F), 21.1-26.7°C (70-80°F), and 26.7-32.2°C (80-90°F). In each case moisture was supplied by a basin of water placed directly below the closed Petri dish containing the inoculated meat so that excessive desiccation would not take place.

An experimnet to determine the growth of food poisoning organisms on pork rind and the external fat of the beef carcass was also carried out by using the above temperature ranges for incubation. Blocks of about 5 grams of lean pork with the rind, and beef with the external fat, were cut from the surface. Each of the 24-hour broth cultures of the organisms used was inoculated on the pork rind and the beef fat. After the inoculation the materials were incubated for 24 hours at the above three temperature ranges before plating. The inoculation in all cases was done by touching a spot in the center of the surface of the meat to be inoculated with a 4 mm wire loop containing the broth culture of the organism until the contents ran down onto the spot. This was done to obtain similar inoculated areas.

DISCUSSION

It is generally believed that cooked meat is more flavorable to bacterial growth than fresh meat, probably due to the breaking down of nutrients to more assimilable forms. It is interesting, therefore, to note the differences in growth of food poisoning staphylococci and salmonellae on raw beef and pork, especially on raw lean meat taken from the depth of retail cuts, on cooked lean meat, and on the surface of raw lean meat prepared and handled in retail trade.

Since meat may be contaminated on the surface with food poisoning staphylococci and salmonellae from the time of killing to sale, this was a study of the viability of the organisms on meat kept at different atmospheric temperature ranges exclusive of a very high range such as 32.2-37.8°C (90-100°F) or a low range such as freezing.

Brewer[2], in his work with the bacterial content of market meats, concluded that prepared meats usually contained more bacteria than fresh meats, and that of the bacteria encountered in the different meats the colon group predominated. Jensen[20] found that coliform organisms were abundant and ubiquitous on the killing floor, and were almost invariably found on the surfaces of thecarcasses which are exposed during killing floor operations. Voegeli's work[33] showed that the cutting utensils were responsible to a great extent for bacterial con-

tamination of prepackaged fresh meats.

Waksman[34] extensively reviewed the antagonistic relation between microorganisms living in association including the two-sided antagonism existing between *Escherichia coli* and certain salmonellae. However, strains of *E. coli* varied in their inhibitive power against salmonellae while species of salmonellae varied in their resistance of inhibition of *E. coli*.

In unpublished work by the authors[14] two pure cultures of *E. coli* were isolated, one from a beef carcass and the other from a human stool. Both inhibited *choleraesuis* var. *Kunzendorf* and *Salmonella enteritidis* when grown in association with the salmonellae.

While numbers of bacteria on the surface of pork and beef may be large depending on the contamination from cutting utensils as one of the contributing factors[33], the control plating from fresh lean pork and beef, taken 1 cm beneath the surface, showed comparatively very small counts ranging from 3 to 60 per sq cm. It was evident that the cutting utensils, even when sterile, might still convey some surface bacteria to the deep lean meat.

The data presented here show no marked differences when food poisoning staphylococci were grown at 21.1-26.7°C (70-80°F) on deep lean, autoclaved lean, and surface lean pork and beef. Likewise, salmonellae did not vary significantly in numbers when grown on fresh deep lean meat or autoclaved deep lean meat but showed a great reduction when grown on the surface of fresh lean pork and beef (figures 1 and 2). The reduction in the bacterial counts on surface lean meat may be attributed to the antagonism offered by other organisms growing in association with them, and to less available moisture because some doubtless had evaporated.

Food poisoning organisms appeared to grow better on pork than on beef especially in 21.1-26.7°C (70-80°F) and also at 26.7-32.2°C (80-90°F). No marked increase in numbers of food poisoning staphylococci was observed on lean beef at 10.0-15.6°C (50-60°F) during 24 hours, but the organisms grew on lean pork stored at this temperature range (figures 3 and 4).

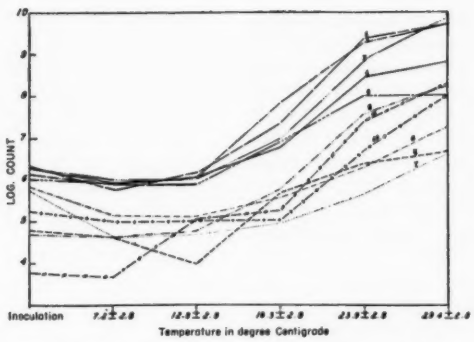

Fig. 3. Growth of Food Poisoning Organisms on Beef at Various Temperature Ranges.

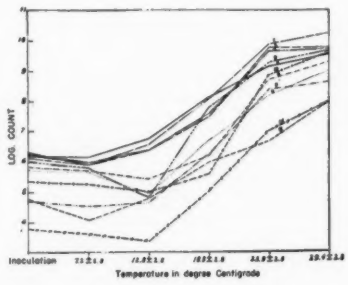

Fig. 4. Growth of Food Poisoning Organisms on Pork at Various Temperature Ranges.

At 10.0-15.6°C (50-60°F) 2 of the 8 species of salmonellae used increased in numbers on lean pork while 5 species decreased in numbers and 1 remained constant. On lean beef at this temperature range 2 of the 8 species of the salmonellae increased in numbers while 6 species showed decreases (figures 3 and 4). This fact indicated that salmonellae were not so active in growth and reproduction at this temperature range on beef and pork.

Temperature ranges between 15.6-32.2°C (60-90°F) were favorable to all test organisms, the optimal range being 26.7-32.2°C (80-90°F). No increase of the test organisms was observed at 4.4-10.0 (40-50°F) on lean pork and beef, (figures 3 and 4) after 24 hours incubation.

External fat of the beef carcass appeared to be rather more favorable to growth of food poisoning staphylococci than pork rind. Salmonellae, however, grew better on the pork rind than on the external fat of the beef carcass, (figures 5 and 6). These coverings compared with the lean meat, were poor media and allowed but little growth of the organisms used (figures 3, 4, 5 and 6). These results indicated that the nutrients present on pork rind and external fat of the beef were limited or possibly not so readily available to the food poisoning bacteria. Therefore, pork and beef should be kept and handled with such natural coverings on whenever possible.

At 26.7-32.2°C (80-90°F) there was generally less growth of food poisoning organisms on pork rind and external fat on the beef than at 21.1-26.7°C (70-80°F), (figures 5 and 6). This was apparently due to the exaporation of the surface moisture. These coverings, of course, contained much less moisture than lean meat.

Effect of Organic Acids and Chloramphenicol

In these experiments chloramphenicol, sodium salt of dehydroacetic acid, acetic acid (from 12 percent distilled vinegar), monochloracetic acid, dichloracetic acid. and trichloracetic acid were tested for their germicidal effects.

Repeated trials with various concentrations of the above organic acids showed that the sanitizing effect of the acids for the surface of pork and beef inoculated with the food poisoning organisms could be distinctly compared at 1 percent concentration A lower concencentration than this allowed too much growth and above 1 percent there was insufficient growth for comparison, especially with those acids which proved to be effective in reducing the counts of food poisoning organisms.

Chloramphenicol was used in 10

mg/ml concentration which was double that used to inhibit salmonellae and most staphylococci[22]. This concentration also compared favorably in price with other chemical solutions used. Futhermore, a high concentration such as 25 mg/ml imparted some bitter taste to the meat treated with the solution.

Blocks of deep lean pork and beef (about 5 grams) were inoculated with 24 hour broth cultures of the food poisoning staphylococci and salmonellae as described previously. After inoculation the pork and beef were incubated at 30°C (86° F) for 90 minutes to allow the evaporation and absorption of the moisture in the inoculum on the surface of the meat. This time interval also simulated the time elapsed between the killing and storing of pork and beef carcasses in the cooler.

After this short period of incubation of the inoculated pork and beef the blocks were dipped in 1 percent freshly prepared aqueous solutions of the acids used in the 10 mg/ml chloramphenicol; each piece of meat was dipped in a separate sterile beaker containing the solution, removed immediately, and placed in a separate sterile Petri dish which was slanted to provide drainage of the solution adhering to the meat.

The Petri dish containing the above inoculated and treated piece of meat was incubated again at 30°C (86°F) for 22½ hours thus completing a 24 hour incubation period from the time of inoculation. At the end of the incubation period the number of bacteria was determined according to the procedure described previously.

The results of these experiments showed that 1 percent acetic acid was the most effective of any of the solutions used in reducing the number of bacteria but still permitted a considerable number to grow. For this reason 2 and 4 percent solutions of acetic acid were tried for sanitizing the meat. The 4 percent of acetic acid solution proved effective as shown in table 1.

To determine any change in flavor due to 4 percent acetic acid, small and large retail cuts of pork and beef were dipped into it and allowed to drip at room temperature, 21.1-26-7°C (70-80°F), for from 1 to 4 hours before cooking for consumption in the regular manner.

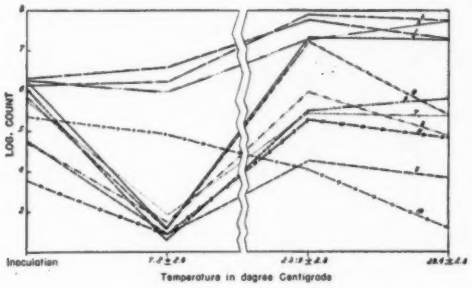

Fig. 5. Growth of Food Poisoning Organisms on External Fat of the Beef Carcass at Different Temperature Ranges.

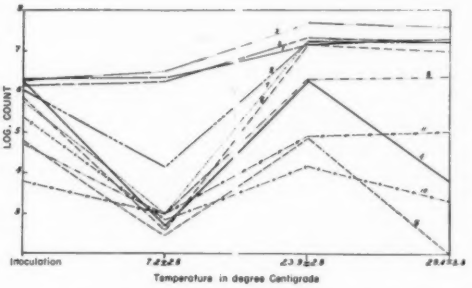

Fig. 6. Growth of Food Poisoning Organisms on Pork Rind at Different Temperature Ranges.

KEY TO FIGURES, 1, 2, 3, 4, 5, AND 6.

Number	Line	Species of Organisms
1.		*Staphylococcus* 172
2.		*Staphylococcus* 178
3.		*Staphylococcus* 196
4.		*Salmonella choleraesuis* var. *Kunzendorf*
5.		*Salmonella paratyphi*
6.		*Salmonella enteritidis*
7.		*Salmonella gallinarum*
8.		*Salmonella Schottmuelleri*
9.		*Salmonella typhimurium*
10.		*Salmonella pullorum*
11.		*Salmonella typhosa*

Also to observe physical changes on larger pieces of pork and beef than those used for experimental work, chunks of beef and pork (about 30 to 100 grams) were dipped in 24 hour broth cultures of the food poisoning staphylococci and salmonellae. The inoculated pieces of meat were allowed to drip at room temperature for 90 minutes before dipping in the 4 percent acetic acid. These pieces of meat were next wrapped in pieces of moisture-vapor-proof meat wrapping paper or placed in closed Petri dishes for observation after standing 24 hours at room temperature. Control pieces were similarly inoculated and stored but not treated with the 4 percent vinegar.

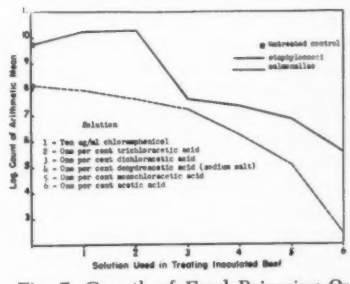

Fig. 7. Growth of Food Poisoning Organisms on Deep Lean Beef Treated with 1% Acid Solution or 10 mg/ml Chloramphenicol (Chloromycetin) after 24 hour Incubation at 30°C.

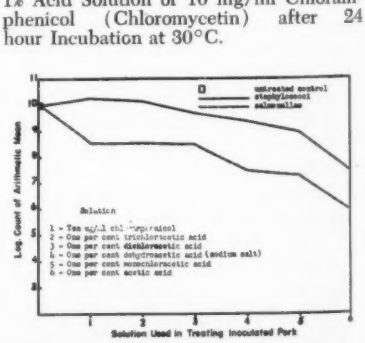

Fig. 8. Growth of Food Poisoning Organisms on Deep Lean Pork Treated with 1% Acid Solution or 10 mg/ml Chloramphenicol (Chloromycetin) after 24 Hour Incubation at 30°C.

DISCUSSION

The strains of the food poisoning staphylococci used in these experiments were found to be much more resistant to the organic acids tested and to chloramphenicol than the food poisoning salmonellae studied, (figures 7 and 8).

When used as dipping solutions for inoculated pork and beef, 10 mg/ml chloramphenicol and 1 percent trichloracetic acid were found, in some instances, to stimulate growth of the food poisoning staphylococci instead of suppressing them, (figures 7 and 8). These solutions in these concentrations were obviously useless for the purpose of sanitizing meat.

The germicidal effect of the acids on the food poisoning staphylococci inoculated on the surface of pork and beef was in decreasing order: acetic, monochloracetic, dehydroacetic (sodium salt) and dichloracetic. The results are found in figures 7 and 8.

Of the 8 species of salmonellae used, S. *choleraesuis* var. Kunzendorf and S. *typhimurium*, inoculated on lean pork and beef, were more resistant than the others to the germicidal action of the acids and chloramphenicol. The salmonellae, however, were not stimulated by 10 mg/ml chloramphenicol or by a 1 percent concentration of the organic acids used. The germicidal effect of the various solutions of the food poisoning salmonellae on the pork and beef in decreasing order was: acetic, monochloracetic, dehydroacetic (sodium salt), dihydroacetic, trichloracetic and chloramphenicol. This germicidal effect on the salmonellae of 10 mg/ml chloramphenicol and of 1 percent trichloracetic acid, however, did not differ very much, (figures 7 and 8).

When used as a dipping solution 4 percent distilled vinegar did not impart any appreciable flavor to the pork or beef. Although a dilute solution of vinegar has been used as a tenderizing agent for some meats[39] no tenderizing effect was noted when pork and beef which had been treated with 4 percent distilled vinegar were consumed. Larger pieces of lean pork (about 30 to 100 grams) which had been dipped in 4 percent vinegar had a slightly whiter surface than normal after a few hours unless wrapped in airtight materials. Both the inoculated and uninoculated lean pork, whether treated or not with 4 percent distilled vinegar, emitted a foul odor and presented an unwholesome appearance after 24 hours standing at room temperature.

SUMMARY

There were no significant differences in the number of food poisoning staphylococci growing on raw fresh and cooked beef and pork.

Salmonellae did not differ significantly in their growth on the raw fresh and cooked lean beef and pork taken from a 1 cm depth of retail cuts. They grew much less readily on the surface of retail cuts of raw beef and pork probably due to the antagonism offered by other organisms grown in association with them and also due to desiccation.

Pork is a better medium than beef for growth of food poisoning staphylococci and salmonellae.

The atmospheric temperature range (exclusive of a very high range such as 32.2-37.8°C (90-100°F) or a low range such as freezing,) optimal for growth of food poisoning staphylococci and salmonellae on lean beef and pork is 26.7-32.2°C (80-90°F). No growth was observed in 24 hours at 4.4-10.0°C (40-50°F) which is the usual refrigerating zone of household refrigerators.

Pork rind is a better medium of growth for food poisoning staphylococci and salmonellae than the external fat of the beef carcass. However, both the rind and the fat are poor media compared to the

TABLE 1—GROWTH OF FOOD POISONING ORGANISMS ON DEEP LEAN BEEF AND PORK TREATED WITH 4 PERCENT ACETIC ACID AND INCUBATED 24 HOURS AT 30°C. TOTAL COUNTS.

Organism	Beef		Pork	
	Untreated	Treated	Untreated	Treated
Staphylococcus 172	5,300,000,000	2,000	18,000,000,000	1,000
Staphylococcus 178	5,400,000,000	43,000	6,200,000,000	12,000
Staphylococcus 196	9,600,000,000	8,300,000	5,400,000,000	13,000
Salmonella choleraesuis var. *Kunzendorf*	630,000,000	310,000	3,300,000,000	0
Salmonella paratyphi	4,400,000	0	82,000,000,000	0
Salmonella enteritidis	16,000,000	1,800	1,900,000,000	0
Salmonella gallinarum	4,000,000	43,000	940,000,000	0
Salmonella schottmuelleri	170,000,000	100	430,000,000	0
Salmonella typhimurium	100,000,000	7,500	4,900,000,000	3,000
Salmonella pullorum	100,000,000	0	3,600,000,000	0
Salmonella typhosa	190,000,000	100	80,000,000	0

lean meat. Pork and beef, therefore, should be kept and handled with these natural coverings intact whenever possible.

The food poisoning staphylococci used in these experiments were more resistant than the salmonellae to the germicidal action of dichloracetic acid. dehydroacetic acid (sodium salt), monochloracetic acid, and acetic acid.

A chloramphenicol solution of 10 mg/ml and a 1 percent solution of trichloracetic acid were found to stimulate growth of the food poisoning staphylococci when used as dipping solutions in an attempt to sanitize the inoculated surface of pork and beef.

When used for sanitizing the surface of the inoculated pork and beef, the germicidal effect on food poisoning salmonellae of the 1 percent organic acid solutions and of 10 mg/ml chloramphenicol was in decreasing order: acetic, monochloracetic, dehydroacetic (sodium salt), dihydroacetic, trichloracetic and chloramphenicol. The germicidal effect on salmonellae of 1 percent trichloracetic acid and of 10 mg/ml chloramphenicol, however, was about the same. The above decreasing order of germicidal effect also applied to the food poisoning staphylococci which had been inoculated on pork and beef except that 1 percent trichloracetic acid and 10 mg/ml chloramphenicol stimulated their growth. Acetic acid was found to be the most effective of all the agents used to sanitize the inoculated lean pork and beef. Four percent distilled vinegar was found to be an effective and practical dipping solution to destroy the food poisoning staphylococci and salmonellae on the surface of pork and beef. If the beef was wrapped in airtight material after dipping in 4 percent distilled vinegar there was no change of color due to this treatment. Furthermore, the treated beef kept longer due to destruction of microorganisms found on the surface.

The destruction of the food poisoning staphylococci and salmonellae on the surface of pork by 4 percent distilled vinegar appeared greater than that of beef due apparently to greater retention of the vinegar on pork. Pork treated with 4 percent distilled vinegar became whiter on the surface than normal. Four percent distilled vinegar did not impart any appreciable flavor to the pork and beef which had been dipped in it.

GENERAL CONCLUSIONS

Pork and beef are good media for food poisoning staphylococci and salmonellae which increased to great numbers at 15.6-32.2°C (60-90°F) in 24 hours.

A refrigerating temperature at 4.4-10.0°C (40-50°F) in the household refrigerator effectively suppressed the growth of the food poisoning organisms for at least 24 hours.

Whenever possible pork should be kept and handled with the rind and beef with the external fat of the beef carcass intact because these natural coverings are poor media for the growth of the food poisoning staphylococci and salmonellae.

Fresh pork and beef should be dipped in four percent distilled vinegar before keeping in cold storage or displaying for sale. This treatment is practical and effective in destroying the food poisoning staphylococci and salmonellae that may contaminate the surface of the meats. The distilled vinegar does not impart any appreciable flavor to the meats.

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VERMONT ANNUAL MILK CONFERENCE

The Thirty-Second Annual Conference for Vermont Dairy Plant Operators and Milk Distributors will be held October 21 and 22 according to an announcement by the Dairy Husbandry Department of the University of Vermont and State Agricultural College, Burlington, Vermont.

A varied program has been arranged that will be of interest to everyone in the Dairy Industry. Dr. R. W. Bartlett, Professor of Agricultural Economics, University of Illinois, will discuss "The Future of the Dairy Industry."

Dr. E. S. Guthrie of Cornell University will discuss "Oxidized Flavors." Cleaning and sanitizing of equipment will be featured and quality control of milk and milk powders.

The new Vermont ice cream law and regulations will be discussed and the aims and purposes of the newly formed Vermont Dairy Commission will be explained.

Other subjects of equal interest are also planned for this conference. The annual banquet will be on Wednesday, October 21.

OFFICIAL CHEMISTS TO DISCUSS NEW METHODS

A scientific attack against hidden filth in food products will be a feature of the 67th Annual Meeting of the Association of Official Agricultural Chemists, to be held at the Shoreham Hotel in Washington, D. C., October 12-14. The A.O.A.C. is the scientific organization which tests laboratory methods required to determine the purity and safety of foods, drugs, and cosmetics, as well as fertilizers, feeds and insecticides.

The complete program now being prepared for distribution about October 1 lists more than 150 papers covering methods of analysis for foods, feeding stuffs, soils, disinfectants and economic poisons, plants, fertilizers, beverages, drugs, cosmetics and colors, and nutritional adjuncts Copies may be obtained by writing the Association at Box 540, Benjamin Franklin Station, Washington 4, D. C.

At least eight papers will be included in a symposium on Extraneous Materials in Foods and Drugs. Isolation and indentification of extraneous matter is the principal means whereby state and federal law enforcement agencies determine the cleanliness of both raw and processed products in the nation's food supply. The symposium will particularly emphasize newer techniques in this field of analysis.

A new principal applying surface-active and complexing agents to obtain more complete extractions of insect fragments and rodent hairs relatively free from plant debris, presented by Mrs. M. G. Yakowitz of the Food and Drug Administration, is expected to have wide application in food analysis.

New radiographic techniques recently introduced for the evaluation of internal damage of wheat will be discussed by Burton A. Burquest, of Pillsbury Mills, Minneapolis, Minnesota. Other applications to the examination of foods and drugs will be presented by J. F. Nicholson of the Food and Drug Administration.

Recent work has indicated that the microscopic counting of insect fragments is probably the most critical phase of insect fragment examination. Modern counting techniques require knowledge of fragment indentification and can often be used to identify the particular insects which infest food and drugs and to determine whether the infestation was introduced in the field, storage, or in processing.

William H. Schoenherr, of the Lauhoff Grain Company, Danville, Illinois, will discuss the identification of insect fragments from cereal products. J. H. McCormack, of Kroger Food Foundation, Cincinnati, Ohio, will discuss insect fragments from other food products, and O. L. Kurtz, of the Food and Drug Administration, will present insect larvae identification by structure as found in cereal products.

A report on collaborative investigations of present methods of isolating extraneous material from white flour will be given by Eric J. Kiteley, of the International Milling Company, Minneapolis, Minnesota. Mr. Kiteley is Chairman of the Sanitation Committee of the American Association of Cereal Chemists.

Another phase of identification of extraneous materials is the identification of mold mycelia, which will be discussed by T. H. McCormack of the Kroger Food Foundation, Cincinnati, Ohio. The identification of manure fragments in dairy products will be presented by Dorothy B. Scott, of the Food and Drug Administration. Howard Smith of the National Canners Association, Washington, D. C., who has worked for many years on the training of plant laboratory workers on methods for extraneous materials will present a discussion of "Instruction in Microanalytical Methods."

The chairman of the symposium on extraneous materials is Kenton L. Harris, of the Division of Microbiology, Food and Drug Administration, U. S. Department of Health, Education, and Welfare.

A MORE CRITICAL SEQUENTIAL PROCEDURE FOR MICROSCOPIC GRADING OF RAW MILK

MAX E. MORGAN AND PATRICIA MACLEOD

Department of Animal Industries, Storrs Agricultural Experiment Station Storrs, Connecticut

Dr. Max E. Morgan was graduated from the State College of Washington in 1939 and received his M.S. from the University of Connecticut in 1941. Upon return from Service as a bacteriologist in the U. S. Army Sanitary Corps he completed his Ph.D. in dairy bacteriology at Iowa State College in 1948. He is now Associate Professor of Dairy Manufacturing at the University of Connecticut.

When numerical estimates of microscopic clump counts are required the present standard method recommends examination of twice as many fields as when samples are merely graded. Alternate sequential grading procedures for two common grade limits have been developed for possible use where clump estimates are now required. Use of these procedures will yield grading results of a precision equal to that of the present recommended method concomitant with an average saving of at least 20 percent in the number of fields examined. Adaptability of the sequential procedure where the estimated clump counts of several samples of a producer's milk are averaged logarithmically during a grading period is discussed.

Sequential tables for grading raw milk samples on the basis of their bacterial clump content have been developed for several grade standards[1, 2]. These tables are based upon the expected operating characteristic curve for the present standard method for "grading samples" with the modification that milk with a count exactly at the grade limit is rejected. When compared to counting the clumps in a constant number of fields (e.g. when MF=600,000 and the grade limit is in the range of 30,000 to 300,000 clumps per ml 30 fields are examined)[3] the use of the sequential grading procedure results in substantial savings in the average number of fields to reach a decision and yields results of a precision equal to or greater than that expected with the present standard method.

Although suitable for use in rapid routine grading of milk samples, the present sequential procedure is not critical enough for possible adoption in grading programs where "actual numerical estimates" of bacterial clumps per ml are now required. When such estimates are required the number of fields examined should be twice that required when merely "grading samples," e.g. when MF=600,000 and the grade limit is in the range 30,000 to 300,000 clumps per ml 60 fields are examined)[3]. The purpose of this paper is to present sequential grading procedures for standards of 100,000 and 200,000 bacterial clumps per ml which will have a precision equivalent to that where actual numerical estimates are now made.

Operating Characteristic Curve for the Present Standard Method for Making Numerical Estimates

When using a microscopic factor of 600,000 a film from a milk meeting a standard of 100,000 clumps per ml ideally would reveal less than 10 clumps in 60 fields. The corresponding limit for a standard of 200,000 clumps per ml would be 20 clumps in 60 fields. These limits correspond to the vertical lines in figure 1 at 0.166 and 0.333 clump per field. Since the number of clumps in standard milk films varies at random from field to field and the clump distribution follows a Poisson series in this range[1], the theoretical performance of the above grading criterion can be expressed by the operating characteristic curves in figure 1. These show the probability of accepting samples of milk plotted against their true clump contents when any milk is rejected which has a total count of 10 and 20 or more clumps in 60 fields respectively. The curves were computed from the expected proportionate frequencies of 10 and 20 or more clumps at different values of the Poisson parameter.[4]

As interpreted from the curve for the 100,000 clump standard, 20 percent of the milk passed as meeting the standard would be expected to have counts of 124,000 clumps per ml or more and 20 percent of the milks rejected as not meeting the standard would have counts of 73,000 clumps per ml or less. Interpreting from the curve for the 200,000 clump standard, 20 percent of milks having counts of 236,000 clumps per ml or more would be accepted and 20 percent of the milks rejected as not meeting the standard would have counts of 161,000 clumps per ml or less. Since both curves cross the grade limits slightly below the 50 percent acceptance point, use of these curves would tend to increase slightly the producer's risk, e.g. rejecting samples that should be accepted. This discrepancy would tend to enforce slightly better compliance with sanitary regulations but is not of sufficient magnitude as to place any undue hardship on producers.

Sequential Grading Plan

In designing sequential grading plans which would have essentially the same operating characteristic curves as those in figure 1, the number of samples which would be accepted or rejected incorrectly was limited to 5 percent at theoretical clump densities of 0.0904 and 0.2625 per field for the 100,000 clump standard and 0.2209 and 0.4649 per field for the 200,000 clump standard. These points are indicated in figure 1 as solid circles. Using these limits, acceptance and rejection equations were calculated for the Poisson variate in the manner previously described[1]. In the sequential plan for the 100,000 clump limit samples would be accepted when d_1 is equal to or less than $-2.7629 + 0.1614N$ and rejected when d_2 is equal to or more than $2.7629 + 0.1614N$. In the 200,000 clump limit plan samples would be accepted when d_1 is equal to or less than $-3.9568 + 0.3279N$ and rejected when d_2 is equal to or more than $3.9568 + 0.3297N$. In these equations d equals the total number of clumps observed and N the total number of fields examined.

To check the agreement of the proposed sequential plans with the curves in figure 1, values for the expected sequential operating characteristic curves were calculated as previously described[1]. These points

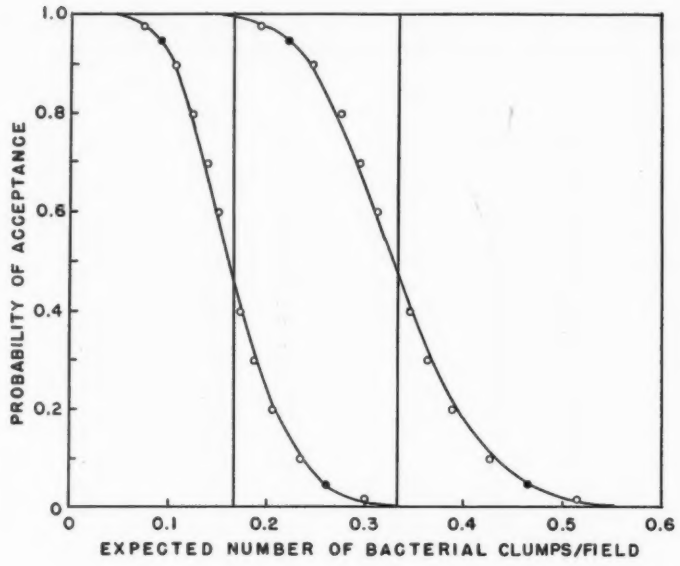

FIGURE 1... Operating characteristic curves for grading limits of 100,000 and 200,000 clumps per ml.

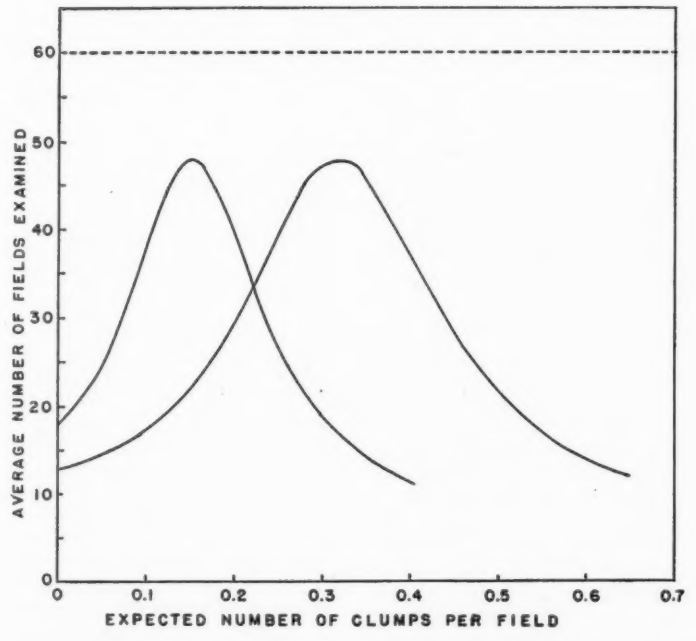

FIGURE 2. Expected average number of microscopic fields examined in reaching a decision to accept or reject samples with the sequential procedure for grading limits of 100,000 and 200,000 clumps per ml.

are plotted in figure 1 as open circles. The agreement is satisfactory and where the curves diverge the sequential plan lessens slightly both the consumer's and producer's risk.

The curves in figure 2 show the average number of fields to be examined for different expected clump densities with the sequential grading procedures, as determined theorectically for a Poisson distribution[1]. The maximum average number of fields is 48 when the expected number of clumps per field is slightly less than either grade limit. The uniform number of fields specified in the standard method when numerical estimates are to be made for these two grades is indicated by the horizontal dotted line at 60 fields. The expected saving in microscopic examination through use of the sequential procedure is considerable on borderline samples and becomes progressively greater on samples which are more or less contaminated.

PROPOSED GRADING PROCEDURE

The values for d_1 and d_2 in the sequential grading tables 1 and 2 were determined by solving the respective acceptance and rejection equations at different values of N, the number of fields examined. Since the table values for d_1 and d_2 must necessarily be discrete whole numbers, the calculated values for d_1 were rounded to the last whole number and the d_2 values to the next higher whole number. Whether to accept or reject milk for the standard may be determined from the respective table as the clumps in each field are counted. The counting procedure as previously recommended[1] should be followed with the exception that 10-field transits of the film should be made until a decision can be reached.

Although the number of fields required to reach a decision may be larger or smaller than that expected for a given film, the grading procedure has been truncated at two and one-half times the maximum expected average number of fields or at 120 fields. As noted in the 100,000 clump limit table a

TABLE I—SEQUENTIAL TABLE FOR GRADING LIMIT OF 100,000 CLUMPS PER ML

A milk in which the total number of bacterial clumps does not exceed the acceptance number d_1 in a given number of fields is accepted; one in which it equals or exceeds the rejection number d_2 is rejected.

Field No.	d_1	d_2	Field No.	d_1	d_2	Field No.	d_1	d_2	Field No.	d_1	d_2
1	–	3	31	2	8	61	7	13	91	11	18
2	–	4	32	2	8	62	7	13	92	12	18
3	–	4	33	2	9	63	7	13	93	12	18
4	–	4	34	2	9	64	7	14	94	12	18
5	–	4	35	2	9	65	7	14	95	12	19
6	–	4	36	3	9	66	7	14	96	12	19
7	–	4	37	3	9	67	8	14	97	12	19
8	–	5	38	3	9	68	8	14	98	13	19
9	–	5	39	3	10	69	8	14	99	13	19
10	–	5	40	3	10	70	8	15	100	13	19
11	–	5	41	3	10	71	8	15	101	13	20
12	–	5	42	4	10	72	8	15	102	13	20
13	–	5	43	4	10	73	9	15	103	13	20
14	–	6	44	4	10	74	9	15	104	14	20
15	–	6	45	4	11	75	9	15	105	14	20
16	–	6	46	4	11	76	9	16	106	14	20
17	–	6	47	4	11	77	9	16	107	14	20
18	0	6	48	4	11	78	9	16	108	14	20
19	0	6	49	5	11	79	9	16	109	14	20
20	0	6	50	5	11	80	10	16	110	14	20
21	0	7	51	5	11	81	10	16	111	15	20
22	0	7	52	5	12	82	10	17	112	15	20
23	0	7	53	5	12	83	10	17	113	15	20
24	1	7	54	5	12	84	10	17	114	15	20
25	1	7	55	6	12	85	10	17	115	15	20
26	1	7	56	6	12	86	11	17	116	15	20
27	1	8	57	6	12	87	11	17	117	16	20
28	1	8	58	6	13	88	11	17	118	16	20
29	1	8	59	6	13	89	11	18	119	16	20
30	2	8	60	6	13	90	11	18	120	19	20

count of 19 or fewer clumps in 120 fields is accepted and one of 20 or more is rejected. In the 200,000 clump limit table a count of 39 clumps or less is accepted and one of 40 clumps is rejected at 120 fields. This device for limiting the counting procedure on borderline milks has but little effect on the producer and consumer risks[5].

DISCUSSION

Since the sequential grading plans proposed here were developed from the theoretical operating characteristic curves for the procedure where grade compliance is determined from a 60-field clump count, use of the sequential plans should yield grading results of a precision at least equal to that defined by the sequential operating characteristic curves. Previous experience has revealed that the observed precision is very likely to be greater than that defined by the theorectical operating characteristic curves.[1, 2]

In using the proposed grading tables as many as 120 fields may have to be examined occasionally in films of borderline milk before a decision may be reached. Since, however, the theoretical average number of fields on borderline milk is only 48, the expected saving in the number of fields examined with such milk is 20 percent. The saving becomes progressively greater with milks of better or poorer sanitary quality. Therefore, the overall saving in microscopic examination by use of the sequential tables should be in excess of 20 percent.

Since the results of sequential grading of milk samples would be reported as acceptable or rejected for the particular grade, the question arises as to how to satisfy producers, fieldmen and health authorities who insist on having actual counts reported so that they may judge the degree of compliance with the particular standard. In view of the degree of accuracy predicted by the operating characteristic curves for the present standard method, reporting actual numerical estimates gives a false impression of accuracy and would seem to be a questionable practice. At present it is suggested that, where necessary, those interested in degree of compliance be given reports indicating the field number at the point of acceptance or rejection. Such a report might read "reject 20" which would indicate a relatively poor quality milk or

TABLE 2—SEQUENTIAL TABLE FOR GRADE LIMIT OF 200,000 CLUMPS PER ml.

Field No.	d_1*	d_2*	Field No.	d_1	d_2	Field No.	d_1	d_2	Field No.	d_1	d_2
1	—	5	31	6	15	61	16	24	91	25	34
2	—	5	32	6	15	62	16	25	92	26	35
3	—	5	33	6	15	63	16	25	93	26	35
4	—	6	34	7	16	64	17	25	94	26	35
5	—	6	35	7	16	65	17	26	95	27	36
6	—	6	36	7	16	66	17	26	96	27	36
7	—	7	37	8	17	67	18	26	97	27	36
8	—	7	38	8	17	68	18	27	98	28	37
9	—	7	39	8	17	69	18	27	99	28	37
10	—	8	40	9	18	70	18	27	100	28	37
11	—	8	41	9	18	71	19	28	101	29	38
12	—	8	42	9	18	72	19	28	102	29	38
13	0	9	43	10	19	73	19	28	103	29	38
14	0	9	44	10	19	74	20	29	104	30	39
15	0	9	45	10	19	75	20	29	105	30	39
16	1	10	46	11	20	76	20	29	106	30	39
17	1	10	47	11	20	77	21	30	107	31	40
18	1	10	48	11	20	78	21	30	108	31	40
19	2	11	49	12	21	79	21	30	109	31	40
20	2	11	50	12	21	80	22	31	110	32	40
21	2	11	51	12	21	81	22	31	111	32	40
22	3	12	52	13	22	82	22	31	112	32	40
23	3	12	53	13	22	83	23	32	113	33	40
24	3	12	54	13	22	84	23	32	114	33	40
25	4	13	55	14	22	85	23	32	115	33	40
26	4	13	56	14	23	86	24	33	116	34	40
27	4	13	57	14	23	87	24	33	117	34	40
28	5	14	58	15	23	88	24	33	118	34	40
29	5	14	59	15	24	89	25	34	119	35	40
30	5	14	60	15	24	90	25	34	120	39	40

* Interpret as in table 1.

"accept 115" which would indicate barely acceptable quality.

Instead of using the geometric average clump count of several samples from a particular supply during a grading period and comparing this average to the grade standard as is required by regulation in many areas, an alternate procedure using the sequential tables would be to limit the number of rejections permitted during the grading period. For example it might be required that three out of four samples be acceptable. This would allow the producer one chance in four for possible breaks in sanitary procedure.

ACKNOWLEDGMENT

The authors wish to express their appreciation to Dr. C. I. Bliss, Biometrician of the Connecticut Agricultural Experiment Station, New Haven, for his continued interest and assistance in the development of sequential methods for grading milk by microscopic counts.

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RUSSELL J. EGGERT JOINS PENNSALT'S B-K DEPARTMENT

Russell J. Eggert has joined the Pennsylvania Salt Manufacturing Company as Sales Representative for the B-K Department, is was announced by S. H. Crounse, Sales Manager.

Mr. Eggert will handle sales of Pennsalt's complete B-K line, including hyochlorities, alkalies and cleansers, in the Memphis area.

A graduate of Fenn College, he was previously engaged in sales work for the Diversey Corp. in Chicago, and for the George S. Daugherty Co. of Pittsburgh.

Mr. and Mrs. Eggert are now making their home in North Little Rock, Arkansas.

MILK and FOOD SANITATION

NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS JUNE 9-10, 1953

St. Louis, Missouri

J. L. ROWLAND, *Chairman*

Summary of Policies Adopted by the First, Second, Third and Fourth National Conference on Interstate Milk Shipments

1950 – 1951 – 1952 – 1953*

REGULATION

Since there is no widely adopted standard available, other than the Milk Ordinance and Code recommended by the U. S. Public Health Service, the 1939 Edition shall be used as the basic standard. Compliance with this standard shall be measured by the U. S. Public Health Service Milk Sanitation rating method.

SUPERVISION

The receiving states should recognize inspection and supervision by the following:

1. Full-time local health department personnel.
2. Full-time local state agricultural department personnel.
3. Full-time local state health department personnel.

Supervision shall be based on the procedure outlined in the 1939 Edition of the U.S. Public Health Service *Milk Ordinance and Code,* It shall be measured by the enforcement rating procedures outlined in Reprint Number 1970 from the *Public Health Reports* entitled "Methods of Making Sanitation Ratings of Milk Sheds."

It was recommended at the 1953 *conference that the* 1953 *United States Public Health Service Milk Ordinance and code be used as the basic standard in place of the* 1939 *code as soon as the United States Public Health Service uses the* 1953 *code for survey rating purposes.*

The certifying agency in each shipping state shall be responsible for maintaining a record of volume control either directly or through designated agencies. A complete method of volume control should include monthly reports from each shipper on total quantity received and its subsequent utilization. These reports should be audited periodically.

CERTIFICATION

Receiving states should accept ratings made only by certified rating officials of either the United States Public Health Service or the state Health Department or department having sole jurisdiction of milk sanitation, providing the survey officials are certified by the United States Public Health Service. Certification shall include survey ratings on:-

1. Producing farms.
2. Receiving stations or plants.
3. Enforcement rating of the supervising agency.

It is the responsibility of state certifying agency to keep the rating of supplies within their state current.

Area ratings shall be made not less than every two years. If an individual source is in a 90% rating area, an individual rating is not necessary, provided that individual ratings shall be furnished upon request of the receiving area. Milk plants or individual sources not under an area survey or which are in areas with less than 90% ratings shall have surveys made (not less than every two years) but not more often than semi-annually. If a request is received for a milk source not under recognized supervision, the survey will be denied.

The U. S. Public Health Service is to initiate a program to standardize the rating procedure of:

1. Its own personnel.
2. State rating officials.

There shall be published by the U. S. Public Health Service a list of state survey officers who have been standardized and whose rating methods have been spot-checked and approved by the U. S. Public Health Service.

All interstate shipments of milk shall be sealed at the time of loading with a single service seal in such a manner as to prevent unauthorized additions or withdrawals.

Sanitation compliance rating of interstate milk shipment shall indicate whether or not a plant is receiving milk other than the milk represented by this rating and the permit number of the plant shall be shown on the list.

When an exported supply (raw or pasteurized) changes status because of degrading or permit revocation, the shipping state shall immediately notify the receiving state and the U. S. Public Health Service. The receiving state shall likewise notify the shipping state of any irregularities in the imported supply.

All interstate shipment of milk or milk products shall be accompanied by copies of a bill of lading. One copy of the bill of lading shall be retained by the consignor, one copy shall be retained by the common carrier and two copies shall be delivered to the consignee with the shipment. The consignee shall forward one copy to the local health authority or, in its absence, to the state health authority.

Such bills of lading shall show information required by the Interstate Commerce Commission and in addition-

(1) The grade of the product, i,e., A. B. C. or Ungraded,

(2) The date shipped, and

(3) The serial number of the bill of lading and copies, stamped or printed thereon.

These bills of lading, properly filled out, should be accepted by health departments in lieu of special letter, wires or certificates from local health authority for each shipment.

(Note: The 1953 Edition of the U.S.P.H.S. Milk Ordinance and Code under Item 23p requires: "For each tank shipment a bill of lading containing all necessary information shall be prepared in triplicate and shall be kept on file by the shipper, the consignee, and the carrier for a period of 6 months for the information of the health officer." The Code specifies that the consignee's copy shall accompany the shipment.)

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*Footnote- Italic type represents changes made at 1953 Conference, or new material added.

Reprints of this article may be obtained at the office of INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS at a normal cost.

*Report of the first, second and third conference published in Vol 16 No. 2 Journal of Milk and Food Technology.

All containers of bulk milk or milk products in interstate shipment shall carry label tags. Such tags may be those prescribed by the Milk Control Authority supervising the consignor's milk supply; Provided, that the minimum requirements of Section 4, of the 1939 Edition of the U.S.P.H.S. *Milk Ordinance and Code* are complied with.

LABORATORY

The procedure outlined in the latest edition of *Standard Methods for the Examination of Dairy Products* of the American Public Health Association shall be followed strictly. Where alternate methods are permitted by the Standard Methods, milk intended for interstate shipment should be examined by either the standard plate count or the direct microscopic count. This examination shall include routine samples from each producer. Samples from each dairy farm shall be examined not less than the frequency prescribed in the 1939 Edition of the *Milk Ordinance and Code* recommended by the U. S. Public Health Service. The state may accept the results from local official laboratories which have been approved as complying substantially with American Public Health Association Standard Methods and checking closely with results obtained at least twice a year on split samples. The state may accept the results from officially designated laboratories which they have similarly officially checked periodically and found to be satisfactory. By "officially designated laboratories" is meant a private laboratory authorized to do official work by the supervising agency, or a milk industry laboratory similarly officially designated for the examination of Grade A rawmilk for pasteurization.

The requirements as to adherence to Standard Methods as to frequency of sampling, as to state approval of local laboratories, and as to certification of laboratories of state agencies should apply to both raw and pasteurized milk and milk products. Samples of milk which are picked up from farm tanks by tank truck may be collected by the supervising agency. A non-transferable permit should be issued by the supervising agency, if the existing state regulations do not provide for the collection of milk samples for bacteriological analysis by persons licensed as milk and cream testers.

Similar acceptance of industry sampling is recommended for tank truck and tank car interstate shipment of Grade A raw milk for pasteurization.

The state approval of local laboratories should include an annual visit to the laboratory, at which time evaluation of the quarters, equipment, procedures, results and records shall be made on appropriate survey forms of the U. S. Public Health Service or the equivalent.

To insure uniformity, the U. S. Public Health Service is to spot-check the laboratories of the state agencies participating in the certification of milk for interstate shipment, and to certify their compliance with Standard Methods.

It is recommended that the state certification agency notify the state laboratory agency as soon as possible of required laboratory surveys, and that the state laboratory agency send duplicate copies of its laboratory surveys, together with supporting data of the results of split samples, to the appropriate U. S. Public Health Service Regional Office. The Regional Office should then send one copy of the laboratory survey and data to the Milk and Food Laboratory of the Environmental Health Center. The Environmental Health Center will then spot-check and certify the compliance, or lack of compliance of the state laboratory agency to the appropriate U. S. Public Health Service Regional Office, which in turn, will transmit this information to the certifying agency.

Inquiries were made at both the 1951 and 1952 Conferences relative to tests for the detection of (1) reconstituted milk, (2) flashing milk, (3) antibiotics, and (4) quaternaries. Methods for the detection of reconstituted milk presumably are being worked out by the A. O. A. C. Referee for Reconstituted Milk. Experimental work has been carried out, but not published, on detection of admixtures of raw and heated milks; results indicate the tests will be satisfactory. Tests for antibiotics will be included in the next edition of the Standard Methods. Requirements for precautions in collecting samples of tank truck milk also will be outlined in the next edition of Standard Methods. Information of such tests and requirements may be obtained from the Federal Security Agency, Environmental Health Center, Cincinnati 2, Ohio. It is recommended that the sanitarian and laboratory worker be alert to the possibility of heat treated or chemically treated milk and that they undertake appropriate tests as needed.

CHANNELS AND FORMS FOR REPORTING

The State Health Officer of the shipping state shall report the results of every survey promptly to the Regional Office of the Public Health Service. That official shall report these results to the other Public Health Service Regional Offices concerned. An individual in the receiving states desiring information on a milk supply should make the request to the state control official in his own state who will transmit the request to the Regional Office of the Public Health Service. Industry in a shipping state desiring a survey should likewise make the request to the regulatory official in his own state.

To expedite information concerning sources on which rating results are not available, requests and reports may be sent direct from one state agency to another state agency with carbon copies of requests and reports being sent to the Regional Office of the U. S. Public Health Service. To implement these procedures, the following are recommended:

1. The present interstate milk shipper survey report form shall be amended as shown on the attached copy.* This report form should be printed in pad form on thin paper and be numbered. Wherever a part of this survey report form is left blank, the reason for such omission shall be indicated.

2. Permission shall be obtained from shippers for the release and publication of survey ratings through the use of an appropriate form.

3. The U. S Public Health Service is requested to publish the shipper compliance rating list semi-annually with supplements to be issued bi-monthly.

4. The Conference proposed to the U. S. Public Health Service that columns 2 and 3 in the listing of compliance ratings of shippers

*See 1951 and 1952 Reports

(May 10, 1951) be changed to show (a) volume of rated supply, and (b) products.

To clarify the designation of the point of origin on milk supplies by the certifying agency, the following was suggested by the 1952 Conference:

1. Modify report form 1659 S. E. to include information about the point of origin of milk (i.e., receiving stations, plants, etc.).

2. Provide for information on form 1659 S.E. regarding whether or not heat treatment is used, (i.e., Yes or No).

3. Reaffirm the necessity of furnishing complete information on the report form submitted by shipping states.

In the event both an area rating and an individual rating are available on an individual source of milk (shipper) the latest rating should be used in reporting.

ROLE OF THE PUBLIC HEALTH SERVICE

The state regulatory authorities should carry their work load involved in the interstate milk program with the assistance of the Public Health Service. The Public Health Service shall be prepared to extend to state regulatory authorities and educational institutions, such assistance in the training of field representatives of the state and local governmental units, or of industry, of plant and field personnel and state survey officers, as the respective states may require in operating the interstate milk shipment plan. The Public Health Service shall sponsor annual seminars of state survey personnel in each of its Regions for the coordination of survey rating procedure and interpretations. The Public Health Service should also train or assist in training laboratory personnel of state or local laboratories or of industry, as requested by state authorities.

The Public Health Service should spot-check the inspection and survey work of enforcement agencies to determine whether milk regulations are being correctly interpreted and enforced.

The Public Health Service should furnish state regulatory agencies periodically with interpretations of regulations based on questions submitted by such agencies and also that state authorities relay such interpretations to local enforcement agencies and/or industry.

It should be recognized that assistance from the Public Health Service can only be effective insofar as state regulatory authorities cooperate. Information can only be disseminated after it has been correctly and promptly submitted by the states. Upon request, interpretations of regulations will be supplied. Therefore, the Public Health Service should urge all state authorities to continuously furnish it with information so that all states may be kept informed. The general purpose of the foregoing statements is to promote uniformity in interpretation and enforcement of standards for interstate milk shipments. The prime role of the Public Health Service is to bring about the highest degree of uniformity in attitude and performance on the part of state authorities so that any certification of milk supply can be accepted with confidence.

EDUCATION

1. Simplification and unification of standards and reciprocity of inspection should be extended and re-emphasized to all groups including regulatory agencies both state and local, industry, educational institutions and the general public.

2. Every member of this Conference should assist in developing further understanding and a broader acceptance of this program through educational methods such as:

1. Use of available material,
2. Personal contacts,
3. Enlistment of cooperation of interested groups at state and local levels,
4. Prepared articles for publication,
5. Appearances on programs.

POLICIES AND RECOMMENDATIONS ESTABLISHED AT THE 1951–1952–1953 CONFERENCES

MANUFACTURED MILK PRODUCTS

The program should be expanded to include all milk constituents used in the preparation of "milk products" as may be defined under Section 1, paragraph K, 1939 edition of the U. S. Public Health Service *Milk Ordinance and Code*, and also to include all milk constituents used in frozen desserts.

In addition the following action on specific products is recommended:

1. Concentrated Milk. Adequate standards shall be formulated for the concentrating operations and the finished products. These shall include the pasteurization and the packaging as a finished Grade A product.

2. Dry Milk Solids. Adequate standards shall be formulated for the drying operations and for the finished product.

3. Supplemental Milk Fats. Adequate standards shall be formulated for supplemental milk fats to be used in milk products and frozen desserts.

The Public Health Service together with representatives of this Conference, the representatives of the national associations concerned with the products affected, including the American Dry Milk Institute, the International Association of Ice Cream Manufacturers, and the Milk Industry Foundation, have taken steps to expedite the formulation of such standards as are necessary.

PROGRESS REPORT OF SPECIAL COMMITTEE CONCERNED WITH DRY MILK STANDARDS

1. In accord with the 1952 National Conference on Interstate Milk Shipments, this committee was raised to the status of a full committee and subsequently its membership was supplemented as recommended.

2. Meetings were held in New Orleans on October 29-30, 1952, and in St. Louis on June 8, 1953. During the interim, various committee members held special conferences with both the United States Public Health Service and the American Dry Milk Institute.

3. It is the consensus of this committee, as a result of its joint work with the United States Public Health Service and the American Dry Milk Institute, that the committee is in a position to develop satisfactory sanitary standards for Grade A dry milks.

4. It is recognized that there is a need for continuing research designed to further improve the processing and control of Grade A dry milk.

*See 1951 and 1952 Reports

5. A mutually agreeable plan of continuing research is to be submitted by the American Dry Milk Institute Grade A advisory Committee to the United States Public Health Service by January 1, 1954.

6. The current interim policy* shall continue until March 31, 1954, after which date it is expected that the standard will be completed and that dry milks from qualified plants may carry a Grade A label.

*Refer to 1952 Report

CANNED STERILIZED WHOLE MILK

In view of the fact that there are no known and recognized standards for the product, "Canned Whole Milk," a committee of this Conference was appointed by the Executive Board to meet with other interested groups in joint session to study the problem. The conclusions which were reached by this committee and passed by the conference are as follows:

1. *Two types of canned sterilized whole milk were recognized*:

(A) *A straight canning sterilization process*

(B) *A modification whereby* H_2O_2 *and enzyme catalase is added to milk and it subsequently canned and sterilized. It was decided that both types should be classified as conforming to the definition of milk in the standard ordinance and code on the basis they are sold and utilized as fresh canned whole milk.*

2. *Questions were raised concerning adulteration of milk with* H_2O_2 *and enzyme under the ordinance and code. Because the adulterant or chemical agents cannot be identified as being present in the final product by any known laboratory methods, the production was considered as milk.*

3. *Existing standards of the ordinance should apply up to the point of processing involving the sealing of containers*

4. *Standards should be developed for the sealing equipment and process.*

5. *A definition must be presented as to what constitutes commercially "sterilized" milk.*

6. *The standard ordinance, item 17p, for cold storage of milk should not apply and a statement concerning this must be drafted.*

7. *With the exception of the above it was the consensus that all other provisions of the ordinance shall apply.*

INDUSTRY INSPECTION UNDER BROAD OFFICIAL SUPERVISION

In those states and municipalities in which the laws and ordinances permit, the regulatory agency may utilize industry inspection providing:

1. *That the competence, intergrity, and objectivity of the industry inspection is established by official check inspections and found to be within an average of five points of the official inspector's ratings.*

2. *That qualified industry inspectors may be issued a permit by the regulatory agency which may be revoked, and*

3. *That the industry inspections shall be supplementary to and not a complete substitute for official inspection.*

Due to the fact that this is a controversial subject and the vote was close with a large number of states passing, it is the opinion of the executive committee that this matter be given further consideration for the purpose of clarification of the controversial points. Decision of the 1953 Executive Board.

RECOMMENDATIONS

Brucellosis: Since Brucellosis is a public health hazard to both the livestock handler and milk consumer, all milk control officials and industry should join forces with their respective state livestock control officials to establish an active and effective program for the eradication of this disease.

It is recommended that the conference go on record encouraging receiving states to recognize brucellosis programs operating under the 1953 *United States Public Health Ordinance and Code. It is also recommended that the conference encourage acceptance of similar plans adopted in local communities and which were passed prior to the adoption of the* 1953 *ordinance and code.*

Water supplies: It is recommended that where water supplies conforming with the United States Public Health Service 1953 *Milk Code or state requirements are not available (such as surface water supplies), the confenence of state sanitary engineers and conference of public health engineers make a study of pond and surface water supplies and make recommendations for their protection and treatment for use on dairy farms and dairy plants.*

Laboratory Approval: It is recommended that the state laboratory agency publish annually or semi-annually a list of those laboratories it has approved including the date and test or tests for which approved. In those states, in which at present there is no recognized state agency for certification of milk laboratories, it is recommended:

(a) *That the state agency within the state which, either by legislation or by established precedent, affords milk laboratory service apply through the state health department for certification from the United States Public Health Service.*

(b) *After certification of the state laboratory agency, this agency in turn may, upon application, then carry out the established routine of certifications of other laboratories within the state.*

It is recommended that the test or tests for which a laboratory is certified be clearly specified on the interstate milk shippers report form 1659 S.E.

PARLIAMENTARY PROCEDURE

1. The Executive Board shall appoint in each year for the purpose of nominating members for the Executive Board, a nominating committee of four, composed of a representative of health and representative of agriculture from shipping states as a group and like representatives from receiving states as a group.

2. Composition of Board. The Executive Board shall be composed of 12 members including the preceding Chairman, who automatically becomes a member of the Executive Board. The remaining 11 members to be selected from the following categories:

One from a State Health Department,

One from a State Department of Agriculture,

One from a Municipal Health Agency.

One from Industry.

As representatives from shipping states as a group, and like representatives from receiving states as a group, plus one representative of the U. S. Public Health Service, one from the U. S. Department of Agriculture and one representative of Educational Institutions.

3. The Executive Board shall elect a Chairman from among its own membership.

4. Term of Office:

As of 1952 the members representing the State Department of Health and the State Department of Agriculture the representative of the U. S. Public Health Service, the representative of the U. S. Department of Agriculture shall be elected for a period of two years. The representative of municipal health agencies and from industry, and the representative of educational institutions shall be elected for a period of one year.

Each succeeding year thereafter members shall be elected to the Executive Board to replace those whose terms have expired.

All members of the Executive Board shall continue to serve until their successors are duly elected.

In addition to those proposed by the nominating committee, nominations may be made from the floor of the Conference, providing they comply with the aforementioned categories.

In the event of a vacancy occurring the Executive Board by its action shall fill such vacancy with a qualified representative for the unexpired term.

(*After re-consideration of the question concerned with the procedure of establishing the executive board, the committee concluded that the present procedure of executive board selection be continued for the coming year, during which period the existing parliamentary committee is to develop a plan for presentation at the next conference.*)

5. Powers of the Chairman:

The Chairman shall, with the approval of the Board, be empowered to appoint as many committees as necessary to carry out the purposes of the Conference and special standing committees as the Conference membership indicates.

The Chairman may appoint a secretary.

6. Roberts Rules of Order shall govern all parliamentary procedures.

RESOLUTIONS—1953 CONFERENCE

1. *That this conference request the United States Public Health Service to confer with the International Association of Milk and Food Sanitarians with the view of utilizing the Journal of Milk and Food Technology for publishing and distributing the interstate milk shipper's list.*

2. *Whereas: The plan of this conference is working so advantageously and without adverse criticism, and*

Whereas: The representatives of states and municipalities have demonstrated such a high degree of cooperation,

Then be it resolved:

That the next regular meeting of this conference be held in 1955 at a time and place designated by the executive committee;

Any two states whose interim problems cannot be satisfactorily settled by the executive committee may demand a special meeting of the conference in 1954, which special conference shall be called by the executive committee.

3. *That the national conference on interstate milk shipment through its executive committee inform the surgeon general of the United States Public Health Service by letter of the objectives, activities and actions of the conference and expressing the thanks of the conference for the most excellent cooperation and assistance rendered by the United States Public Health Service. Further,that this program has made great progress toward its objective and the conference urgently solicits the continuing cooperation and assistance of the United States Public Health Service.*

ADDITIONAL INFORMATION PRESENTED BY TASK FORCE COMMITTEE AND NOT INCLUDED IN OTHER SECTIONS OF THIS REPORT: RELATING TO CERTIFICATION

CERTIFICATION

1. *Should sanitation compliance ratings be reported in terms of 90% or better, etc rather than reporting the specific numerical rating?*

Conclusion: That the present method of reporting the actual numerical sanitation compliance ratings be continued without change.

2. *Survey procedure: What procedure should the survey officer follow to provide information to the local supervisory agency? The basic problem hinged on concern as to how surveys are conducted and the relationship between the supervisory agency and the state survey agency.*

Conclusion: It is not within the scope of the conference to establish a policy on the procedure which the survey officer should follow to provide information to local supervisory agencies. With reference to this problem it was felt that reprint No. 1970 along with the work of the public health service in standardizing survey officers developed applicable procedures.

SUPERVISION

Problem:

How can state, district or local supervisory units finance inspection of milk which is being sold outside local areas?

Conclusion: This matter is primarily one of local concern and yet is important inasmuch as the problem may hinder the interstate and intrastate shipment of milk. The committee arrived at the following conclusions:

1. *It is recognized that this problem does exist and is a common problem.*

2. *It is hoped that we can point out that if milk is to be moved in interstate commerce, satisfactory supervision must be provided.*

3. *The sale of milk in interstate channels is good business for the community and therefore the cost of inspection should be viewed in the light of the total return to the community.*

4. *The cities cannot anticipate utilization and therefore are at times required to inspect more milk than is used locally.*

5. *There is a problem of continuous surplus in some communities which therefore, may result in interstate shipments.*

6. *When necessary the states should recognize their obligation for bearing the cost of inspection of milk sold outside of municipalities conducting milk inspection programs.*

7. *If the cost of inspection of milk sold in intrastate and interstate markets is borne jointly by the city and state duplication of services can be avoided.*

....The committee recommends that where such a local problem exists, the enforcement agency gather together those parties concerned and solve the problem according to the local factors involved.

EXECUTIVE COMMITTEE

C. J. Babcock, in charge standards section, Dairy branch, P.M.A. U. S. Dept of Agriculture, Wash-

ington, D. C

Harold J. Barnum, Division of Hospitals, Denver City Health Dept., Denver, Colo.

Dan H. Evans, Field Milk Supervisor, State Health Dept., Bureau of Food and Drugs, Austin, Tex.

A. C. Fay, Director of Laboratories and Research, H. B. Hood Co., Boston, Mass.

Dr. Milton R. Fisher, Chief of Milk Control, St. Louis Health Dept., St. Louis, Mo.

Dr. R. J. Helvig, Asst. Chief, Milk and Food branch, U. S. Public Health Service, Washington, D. C.

Charles H. Holcombe, Director of Inspections, Dept. of Agriculture, State Office Bldg., St. Paul Minn.

Martin Kloser, Bowman Dairy Co., Chicago, Ill.

C. K. Luchterhand, Secretary, Chief Milk Sanitarian, State Board of Health, State Office Bldg., 1 West Wilson St., Madison, Wis.

J. L. Rowland, Chairman, 1953 Conference, Assoc. Prof. Preventive Medicine and Public Health, K. C. College of Osteopathy, Kansas City, Mo.

Alex Shaw, State Dairy Supervisor, State Dept. of Agriculture, Tallahasee, Florida.

Dr. K. G. Weckel, Chairman, Dept of Dairy and Food Industry, College of Agriculture, Univ. of Wis., Madison, Wis.

PARLIAMENTARY PROCEDURE COMMITTEE

C. K. Luchterhand, Chairman, Wisconsin
John T. Walsh, Secretary, Illinois
J. W. Newlin, Pennsylvania
C. H. Holcombe, Minnesota
P. E. Riley, Illinois
Lloyd Pummill, Oklahoma
A. C. Fay, Massachusette
H. Wainess, Illinois
C. W. Larson, New York

SPECIAL COMMITTEE ON DRY MILK

John T. Walsh, Chairman, Illinois
C. K. Luchterhand, Wisconsin
C. H. Holcombe, Minnesota
K. C. Weckel, Wisconsin
D. E. Whitehead, Mississippi
H. L. Hortman, Louisiana
Martin Kloser, Illinois
C. W. Pegram, North Carolina
J. Lakey, Texas
James Doughty, New Mexico
R. S. Doughty, Pennsylvania
S. M. Rogers, U. S. Public Health Service
Harold Wainess, Secretary, Illinois

FOOD CONTROL DEVELOPMENTS IN BRITAIN

On June 30 the United Kingdom Ministry of Food gave John Wesley Dunn, President of the Food Law Institute a complimentary luncheon in London to honor The Institute. The Ministry was represented by Mr. G. S. Bishop, Undersecretary, Dr. Norman C. Wright, Chief Scientific Adviser and Chairman of the Food Standards Committee, and Mr. N. R. C. Dockeray, Chief of the Food Standards and Hygiene Division (equivalent to the U. S. Food and Drug Administration). Mr. Dockeray is the new chief of that Division, which practically administers the U. K. food law; and he is the successor to Mr. Charles A. Adams, who remains a member of the Food Standards Committee and is a public trustee of our Institute. Mr. Dockeray has agreed to be a public trustee of the Institute. There is attached hereto a recent official statement on the Food Standards and Labelling Division (now the Food Standards and Hygiene Division).

The luncheon was accompanied by a constructive discussion of the U. K. and U. S. food and drug laws and their administration, respectively and comparatively. Incidental to it Mr. Dockeray stated that the Government will introduce a bill to revise and modernize the U. K. food law at the next session of Parliament, which it is hoped will be enacted in 1954.

Much interest was manifested in the food standards procedure and accomplishments under our Food, Drug, and Cosmetic Act. Mr. Bishop, who is officially responsible for the administration of the U. K. food law, indicated that it will be effectively revised to meet its present day needs. The whole discussion at this distinguished luncheon served a very beneficial purpose for due foor law progress in itself and from the standpoint of international uniformity in this law to the available extent.

On June 29 the Society of Public analysts and Other Analytical Chemists gave Mr. Dunn a complimentary dinner in London in honor of The Food Law Institute. (The public analysts make the official analyses under the U. K. food and drug laws; and this organization is analogous to our Association of Official Agricultural Chemists.) The following attended: Dr. D. W. Kent-Jones, President of the Society; Sir Harry Jephcott, President of the Royal Institute of Chemistry and Chairman of Glaxo Laboratories Ltd. (manufacturer of medicinal chemicals and pharmaceutical drugs); Charles A. Adams, formerly with the Ministry of Food and now a member of the Society's Council; Dr J. R. Nicholls, Deputy Chemist in the Ministry of Food and Past President of the Society; Dr. George Taylor, Past President of the Society; Dr. K. A. Williams. Secretary of the Society; and Drs. Voelecker and Allport of the Society.

The U. K. and U. S. food and drug law, respectively and comparatively, were broadly and constructively discussed. The Society will become a general "Society for Analytical Chemistry"; and the public analysts will organize their own new "Association of Public Analysts." They were invited to become a public member of The Food Law Institute and this invitation will probably be accepted. The Food Law Institute includes the highest food and drug law officials of the United States, Canada, and the United Kingdom; and it is the only organization wherein the administrators of this law have joined leading manufacturers subject to it, for its due state. Moreover these London tributes to The Food Law Institute indicate its high international prestige.

The Work of Food Standards and Labelling Division

By the Defence (Sale of Food) Regulations, 1943, it is an offence to describe any food, either on a label or in an advertisement, in such a way that the public might be misled as to its nature, substance or quality, or in particular, as to its nutritional or dietary value. The Regulations also empower the Minister of Food to make Orders (I) imposing specific requirements as to the labelling or marking of food wrappers or containers, and restricting claims or suggestions about the presence of vitamins or minerals when advertising foods; and (II) prohibiting or restricting the addition of any extraneous substances and generally regulating the composition of food products.

(Continued of page 250)

A PUBLIC HEALTH PROGRAM FOR CIVIL* DEFENSE EMERGENCY FEEDING OPERATIONS IN NEW YORK CITY

JEROME TRICHTER

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New York City Department of Health
New York 13, N. Y.

A disaster brought about through atomic or bacteriological warfare will create stupendous environmental sanitation problems of which food control will be only a smaller part. The food problem in the disaster area may be dealt with from three points of view:

1. **Contamination (radioactive, sewage, glass and debris):**
2. **Processing problems caused by disruption of water supply and power; and**
3. **Mass feeding (not only in the disaster area but also in evacuation areas).**

A comprehensive emergency plan for a large metropolitan area is presented which is based largely on prior training and instruction of the sanitarian.

The part played by the civilian-defense food-control official in an atomic energy disaster, in the course of bacteriological warfare, or when other military weapons bring death and destruction to a city, is, in relation to the whole, small. Financing, evacuation, burying the dead, caring for the sick and wounded, billeting the homeless, and the reorganization of civil and industrial life to meet the new war situations, are tasks of such staggering magnitude that it is little wonder that so many think them hopeless of accomplishment and that so little is being done to prepare for them. Fortunately, the food-control problem has natural limitations, and planning is not only possible but when carried out, promises of much fruitfulness if atomic war should strike, as well as much benefit to the welfare and health of the community during its peaceful years.

It is unfortunate that in current thinking and common parlance our problem is described as "food-control." It would be much more satisfactory, once and for all, to designate this subject by what it really is: environmental and food control in civil defense emergencies. This point is emphasized because the greatest contamination and infection of the food supply during a military disaster will come from the outside, from the intestinal tract of man, the flying glass of smashed windows, and the radioactive isotopes in the air, dust, or water. It is that outside environment with its health hazard which must be so contained and controlled as to prevent infection and contamination of the food. In addition, it is not possible nor practical to separate the work of the food-control official from that of the environmental sanitation officer.

Until the moment of the atomic bomb blast, the food supply will be safe and wholesome to the degree that it is at the present. Foods which are potential carriers of pathogenic organisms will have been carefully inspected, controlled, pasteurized or given other heat treatment, refrigerated, and dispensed to the consumer with maximum protection. Foods which are liable to contamination with filth, foreign material, or objectionable matter will have received the most careful surveillance of many food-control agencies at city, state, and federal levels.

Foods which are likely to be adulterated with dangerous or objectionable chemicals will have been under the most intensive scrutiny and exacting examination. and up to that horrible moment of death, destruction, and fierce devastation, the elaborate controls so carefully devised and so conscientiously enforced by thousands of men and women in hundreds of public health and food-control agencies for the protection of the public will operate.

And then the awful moment.....

Mr. Churchill's comments on such a moment are noteworthy:

"Not less formidable", he said, "than the material effects are the reactions which will be produced upon the mind of the civil population. We must expect that under the pressure of continuous air attacks upon London, at least 3,000,000 or 4,000,000 people would be driven out in the open country around the metropolis. This vast mass of human beings, numerically far larger than any armies which have been fed and moved in war, without shelter and without food, without sanitation and without special provision for the maintenance of order, would confront the Government of the day with an administrative problem of the first magnitude. Problems of this kind have never been faced before, and although there is no need to exaggerate them, neither on the other hand, is there any need to shrink from facing the immense, unprecedented difficulties which they involve."

To bring this problem closer to the individual, and it is with individuals that we must be concerned, what has to be envisaged is a family left on the street, after a bomb has fallen in a more or less radioactive environment, outside a damaged house or with no house at all, with no spare clothes, no place

*Presented at the 39th Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., Minneapolis, Minn., Sept. 18-20-1952.

Mr. Jerome Trichter is the Assistant Commissioner of Health in charge of Environmental Sanitation in the New York City Department of Health, and he has been associated with this Department for the past twenty-two years.

As part of his major work in environmental sanitation, Mr. Trichter has always manifested the keenest interest in the problems involved in milk control. The recent developments in the industry and their effect on the production and handling of milk have been his particular concern. In this connection, he was recently appointed by the New York State Commissioner of Health as a member of the Committee to Study Pipe Line Milkers.

to eat or wash or rest, ignorant of what a rest center means or where one is, with only a sparse knowledge of all the multifarious welfare services provided by the authorities, shocked and hazy about what to do and where to go for assistance, food, and shelter. With infinite variations in circumstances, this is the sort of situation which may confront millions of people who will be made homeless during atomic raids.

In connection with the prevention of infection and preservation of health of the victims as related to their food supply, the situation may be somewhat as follows:

CONDITIONS IN DISASTER AREA

The food supply that is available will be in two places—within the disaster area and, outside the disaster area, and the supplies in both places may be divided into three groups:

1. Finished products
2. Partly processed products
3. Raw materials.

First consideration will be given to food stocks in the disaster area. For convenience food stocks, as used here, will include containers and packaging material, which also may be an important source of food contamination. All three groups of products in the disaster area are subject to radio-active isotope contamination.

The second great hazard of contamination will occur when, for one reason or another, sewage is not disposed of in the usual, efficient manner which is now the practice in large cities, and foodstuffs become contaminated with it. Here the greatest hazard will occur when finished foods ready for consumption are exposed to sewage. Contamination of the partly finished foods or raw materials will be less hazardous since additional heat treatment and other sterilizing will accrue to such food during the further processing.

The third kind of hazard to foods within the disaster area and for which preparation must be made is contamination of the foods with splintered glass, debris, and other foreign material, which may be more or less hazardous to health. Here it would seem that the greatest hazard would occur in the case of raw and incompletely processed foods since the foods in this condition are more likely to have large surfaces open and therefore to be more exposed to foreign matter. In addition, the usual methods of commercial food processing do not help much in eliminating foreign material, but, as a matter of fact may increase the problem. Present commercial methods of food processing with the protective packaging of the ready-for-consumer product, are likely to reduce greatly the problem of foreign contamination of finished products.

The fourth kind of problem in relation to food within the disaster area will occur as a result of the lack of water, disruption of power and heating facilities, short-cuts in processing, and disregard of sanitary principles because of the general chaos. Another type of problem which must be kept in mind is the handling of food in central shelters or feeding depots.

Unless strong measures are taken, conditions in such shelters may be like those experienced by the British in their school centers. This is a description of one in Stepney (a suburb of London).

"At night the floor was crowded with people, lying on blankets, mattresses, and bundles of clothing. In the light of dimmed hurricane lamps, some 200 to 300 homeless people had the use of tin pails and coal scuttles as lavatories. By the middle of the night, these containers . . . overflow so that, as the night advances, urine and feces spread in ever-increasing volume over the floor. The space is narrow so that whoever enters inevitably steps in the sewage and carries it on his shoes all over the building. The containers are not emptied until 8 A.M. By dawn the stench . . . . but I leave this to your imagination. Seven basins were available for these people to wash in; no soap, no towels. Water was heated over coals, drinking water kept in baths."

There are many reasons why such situations would not be unlikely under similar disaster conditions in this country.

CONDITIONS OUTSIDE DISASTER AREA

Control of the environment and food supply outside of the disaster area present an entirely new set of problems. In the main, control of the environment and foodstuffs to preserve health and prevent disease will be on a "business-as-usual" basis outside the disaster area. Many adjustments however will have to be made. For example: if much of the population of a large city is bombed out and more evacuated to nearby rural areas, the city will no longer be in need of its regular daily shipments of vast quantities of staple foods, such as milk; milk producers and processors outside the city will have to seek out other places for the disposition of their large production. If hundreds of thousands of children are evacuated from cities to smaller communities, the health protection standards of the small town would have to be suddenly raised in order to meet the needs of the big city that it has become overnight. An example of this is the present practice of many small communities to permit the local sale of raw milk. Minimum health protection requirements would demand that such milk sold for use by thousands of children newly added to the community would now have to be pasteurized.

Another serious environmental sanitation problem in the area outside the disaster region also occurs in connection with evacuation. The English experience in this connection is interesting:

"As soon as the children arrived in the country the trouble began. Somewhat unexpectedly," remarked the Lancet "enuresis has proved to be one of the major menaces to the comfortable disposition of evacuated urban children . . . . every morning every window is filled with bedding, hung out to air in the sunshine. The scene is cheerful, but householders are depressed."

This is not strictly in the nature of a food control problem. Nevertheless, the Environmental Sanitation authorities may be called upon for assistance and advice.

PLAN

What is to be done about these problems? Is a program possible? What kind of planning can be done today that will be effective in the disaster emergency? To establish a total authority to order all things on the site of such a battle might sound attractive, but such a solution is clearly impracticable. The experiences of others prove that there is no ruthless way through the tangle of problems, past the resistant forces of history, and above the rational and irrational desires of men and women. Such forces must be taken into account in planning for war disaster reliefs of all types including food and environment control.

The plan which has been evoked and organized to cope with disorganization and chaos and which, for

convenience, may be called the New York City plan, has two objectives:

1. It prepares, in the best possible way, for the full utilization of all available intelligence to tide the community over the difficult days of a war emergency.
2. If it is never found necessary to utilize the plan for war emergencies, its elaboration will result in great improvement in the food, health, and environmental sanitation services given to the community in peace years. Thus, while preparing for war we are, it is hoped, benefiting the community in peace.

The City of New York is divided into 32 districts, each with about one quarter of a million people. These districts are served in all specialties in environmental sanitation, food control, water supply, housing, sewage disposal, drug control, supervision of x-ray, radioactive isotopes, and many other specialties, by a staff of some 400 specialists in these various branches of environmental sanitation. Some of these special services, such as the supervision of restaurants, operate on a district basis, while others, such as the control of the water and milk supply, operate on a centralized city-wide basis. For the purpose of war emergency, however, the organization is on the basis of the 32 districts.

In the plan, each health inspector in an area is given a map of his district in which are spotted the milk plants, fire houses, water pumping stations, large food operations, police stations, hospitals, chemical supply houses, emergency shelters, and all other strategically important establishments which are related in one way or another to the war emergency. In addition to the map of his own district, each individual is given a set of maps similarly detailed for the 31 other districts in the City.

The second step in the plan is to provide training in all aspects of environmental sanitation for the specialists now carrying out specific jobs. Thus the milk specialist becomes familiar with sewage-disposal problems, the water expert with restaurant control, and the restaurant sanitarian with housing problems. The meat inspector will be oriented in the bacteriology of water supplies, the drug inspector with the control of milk supplies, the milk expert with the supervision of x-ray equipment, and the school inspector with food-sampling procedures, and so on, until there is complete interchange of basic information in all aspects of food and drug control and environmental sanitation. Finally, all of the staff are given basic training in the use of equipment for the measurement of contamination with radioactive isotopes and in the decontamination of hazardous materials.

In addition to this, all personnel have been given training in first aid. With this kind of experience, whatever number of personnel is left within the disaster area will be able to operate effectively in the whole field of environmental sanitation. It is indeed awkward to think of the health inspector having to reply to a desperate plea for help that he cannot advise in connection with milk problem because his peacetime job consisted of the inspection of restaurants only.

After the first period of the emergency during which the police, fire, military, medical, and welfare authorities must put out fires, remove the sick and wounded, give first aid, and bury the dead, the monitoring of the bombed-out area begins, and here the health inspector starts his work.

When monitoring is completed and decontamination processes are started, the second or post-emergency period begins. During this period the health inspector will set himself up as the control officer in environmental sanitation matters in his district and place himself under the supervision of any higher health official with greater authority if one is available. If communication is possible, he will advise all other officials whom he can contact that he is on duty. He will secure all available intelligence concerning radioactive contamination in nearby districts and give all information that he has. He will organize the area as well as he can using all possible community resources (with which he has been made familiar in his training) to give the public notice of what is dangerous and what is safe. If precautions are to be taken in connection with the use of certain foods or materials it will be the duty of the health inspector to disseminate such cautionary notices as quickly and as effectively as possible. When he has completed this task in his own district, he will then proceed to perform the same function in another area.

Part of the preparation is the peacetime inspection of over 800 hotels, restaurants, schools, churches, and auditoriums in the City of New York, which have been designated as emergency shelters and feeding-stations. The civil defense food authority has prepared menus for evacuees, under varying situations of available fuel and water supply. During an emergency, it will be incumbent upon the food authority to procure supplies of food which will have to pass inspection in order to meet the nutritional needs as closely as possible. In addition to feeding at shelters, there will have to be distribution of foods at supply centers set up within the disaster area for use by persons who are not completely evacuated from their homes. Such food supplies and feeding stations will be controlled by the public-health officer as previously outlined.

It is significant, in this connection, to note the English experience in which the people in a bombed-out area gave every indication of wishing to remain in their own homes, even though the home was in a battle-site area. It is the opinion of many that keeping people in their own homes, to the extent that war conditions will permit, is a practical public-health measure for avoiding disease. Since it is more than likely that the course of action which will be taken in a disaster will be dictated by conditions of the moment, plans must be made for the public-health control of emergency-feeding stations as well as extensive distribution of public supplies for use in the home and this is the principle which is applied here.

DETERMINATION OF PROTEIN REDUCING VALUE OF MILK AS AN INDICATION OF THE PRESENCE OF NONFAT DRY MILK SOLIDS

R. P. Choi, A. F. Koncus, Gerald Cherrey, and R. J. Remaley

American Dry Milk Institute, Inc.
Chicago, Illinois

A method has been developed which appears to be reliable for differentiating between pasteurized milk and pasteurized milk containing a relatively small amount of reliquefied nonfat dry milk solids. This method is based upon the determination of the ferricyanide reducing value of the protein faction of milk. From the examination of 117 different brands of milk from different areas of the country, it was found that the protein reducing value of 4.07 mg potassium ferrocyanide per 100 ml of milk might be tentatively established as the maximum value for normal pasteurized milk. Any values above this indicate either (1) excessive heating of the milk during pasteurization, or (2) the presence of reliquefied nonfat dry milk solids or other forms of processed milk solids. If the conditions used in pasteurization are not known, determination of the undenatured whey protein nitrogen content of the milk will help in differentiating between these two possibilities.

The use of reliquefied nonfat dry milk solids to supplement the fluid milk supply of certain areas during periods of milk storage has been recognized as a practical solution to this problem. Because of the lack of a reliable control method to differentiate between pasteurized milk and pasteurized milk containing a portion of reliquefied milk, the use of nonfat dry milk solids has been subject to many local restrictions. Recent improvements in the production of nonfat dry milk solids for beverage purposes, however, have made the problem of ascertaining the presence of this product in fluid milk increasingly difficult. The method of Evenson[8] and its various modifications[9,12,13] as well as recently proposed methods such as those of Edwards[7], Featro and Moore[10], Bassett[4], and Babad *et al.*[3] appear to lack sensitivity for "low heat" or beverage type nonfat dry milk solids.

It is generally known that reducing groups, which may consist of sulphydryl compounds derived from protein denaturation and as yet unidentified compounds resulting from the "browning" reaction, are produced in the heat treatment of milk. Studies of Chapman and McFarlane[5] and Crowe *et al.*[6] have shown that, as a result of heat treatment received in processing, the capacity of dry milk products to reduce ferricyanide is much greater than that of the unheated fluid milk. These investigations, however, have been concerned mainly with the reducing capacity of the entire milk system, which, of course, includes reducing substances such as ascorbic acid that are not produced by heat treatment. It was thought that a more specific and perhaps greater difference between the reducing capacities of dry milk and fluid milk is to be found in the protein phase and that this difference, if sufficiently large, may offer a method which would indicate the presence of relatively small amounts of reliquefied milk in fluid milk.

On this basis a method has been developed for determining the ferricyanide reducing value of the acid precipitated protein curd (protein reducing value). This method is somewhat similar to the Chapman-McFarlane ferricyanide method for milk[5] except that a saturated urea solution is used to disperse the curd and a pH of 5.6 instead of 5.0 is used for the reaction. When reliquefied nonfat dry milk solids is added to fluid whole milk, the protein reducing value increases with the amount added. This increase has been found to be sufficient to enable the differentiation of pasteurized milk from pasteurized milk containing a relatively small amount of reliquefied nonfat dry milk solids.

Method

Pipette 15 ml of milk, previously adjusted to 20°C, into a 50-ml graduated centrifuge tube of the type used for solubility index determinations[1]. Dilute with an equal volume of water. Add 3 ml of 5 percent acetic acid solution and mix thoroughly. Centrifuge for 5 minutes at about 1000 rpm. Decant the supernatant liquid and wash the precipitate twice with 15 ml of water, centrifuging and decanting each time. To the precipitate, add 3 ml of saturated urea solution. Stopper the tube with a clean rubber stopper and shake to disperse the precipitate. Wash the stopper and the wall of the tube with 5 to 10 ml of water. By means of a stirring rod dislodge any curd adhering to the wall of the centrifuge tube. Dilute the volume to 15 ml. Run a blank with 3 ml of urea solution, 12 ml of water, and proceed as with the sample. To each tube add 5 ml of phthalate buffer (pH 5.6), 5 ml of 1 percent potassium ferricyanide solution, and mix the contents thoroughly. Heat the tubes in a water bath at 70°C for exactly 20 minutes. Cool and add 5 ml of 10 percent trichloroacetic acid with stirring, dislodging any curd that remains on the wall of the tube by means of a stirring rod. Filter through Whatman No. 40 filter paper and discard the first few milliliters of the filtrate. If the filtrate shows any turbidity, refilter through the same filter paper until clear. Pipette 5 ml of the clear filtrate into a clean dry test tube. Add 5 ml of water and 1 ml of a freshly prepared 0.1 percent ferric chloride solution. Mix. After 10

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minutes set the blank at zero extinction (100 percent transmission) and determine the color extinction in a Pfaltz-Bauer fluorophotometer using a filter having a maximum absorption at 6100 Angstroms. Other photo-electric colorimeters may also be used From a reference curve determine the protein reducing value in terms of milligrams of potassium ferrocyanide per 100 ml of milk by multiplying the value obtained from the curve by the factor 66.7.

Milk samples for this test can best be preserved by refrigeration. Do not use formaldehyde, mercuric chloride, and sodium fluoride as preservatives and avoid any substances that may have an oxidizing or reducing action.

Reference Curve. Weigh exactly 0.1147 gm of potassium ferrocyanide trihydrate (c.p. Baker) and transfer quantitatively into a liter volumetric flask. Dissolve and dilute to volume with distilled water. For a working standard, dilute 50 ml of this to 100 ml. Each milliliter of the working standard contains 0.05 mg of potassium ferrocyanide. Because of air oxidation the standard solution should be used immediately after preparation. Pipette 0.50, 1.00, 1.50, 2.00, 3.00, and 4.00 ml into a series of clean, dry test tubes. Add water to give a total volume of 5.00 ml. To each tube add 5.00 ml of a solution having the same composition as the blank used above, but not heat treated at 70°C. Develop and read the color as above, and plot the color extinction values against milligrams of potassium ferrocyanide.

RESULTS AND DISCUSSION

Reproducibility. From the work of Chapman-McFarlane[5] it appears that the ferricyanide reducing value of milk depends a great deal on the pH, temperature, and time of reaction. Under the conditions adopted in the present method, results are reproducible as indicated by the standard deviation of ±0.227 obtained from eight replicate determinations on a sample of milk having an average protein reducing value of 7.36 milligrams potassium ferrocyanide per 100 ml.

Analysis of Fluid Milks Containing different Amounts of Reliquefied Nonfat Dry Milk Solids. The sensitivity of the method in indicating the presence of reliquefied nonfat dry milk solids was studied by determining the increases in protein reducing value with the addition of different reliquefied nonfat dry milk solids at different levels. Samples of relatively fresh spray process nonfat dry milk solids, particularly those of the "low heat" type, representing products of 17 different manufacturers, were reliquefied at the rate of 10 gm per 100 ml of water, and added to fresh pasteurized whole milk in concentrations of 0, 3, 5, and 10 percent. These were analyzed for protein reducing substances by the above method. Data are presented in table 1. Whey protein nitrogen content of the nonfat dry milksolids was included to give an approximate indication of the preheat treatment used in the manufacture of the dry milk.

The high whey protein nitrogen values obtained indicate that most of the dry milk used was of the "low heat" type. It will be noted that in every case the amount of protein reducing substances increased with the amount of reliquefied nonfat dry milk solids added. The increase in almost all cases is great enough to indicate a 3 percent addition if a sample of the original fluid milk is available for comparison. Since this ideal situation cannot be depended upon generally, the level at which the presence of reliquefied nonfat dry milk solids can be ascertained by this method must, therefore, depend on the range of variation of the protein reducing values of normal pasteurized fluid milk.

Variation of the Protein Reducing Value of Pasteurized Fluid Milk. To determine this, samples of different brands of fresh pasteurized milk was collected during the winter months of 1951-1952 from both the Chicago area and the Louisiana-Mississippi area. Insofar as possible, information concerning the pasteurization of these samples was obtained. Altogether 67 different brands of milk from these areas were analyzed for protein reducing value, fat[1], total solids[2], and on some samples, whey protein nitrogen by the Harland-Ashworth method[11], using a factor of 1.07 for converting values read from the reference curve to milligrams of nitrogen per ml. Because of their differences in processing, homogenized and unhomogenized milks were considered as different brands in this study even though they may be from the same plant. The protein reducing values are plotted in the first three columns of figure 1

The protein reducing value of these 67 brands of milk varies from 2.40 to 9.47 mg potassium ferrocyanide per 100 ml. Most of the milks (80 percent) have protein reducing values of 4.07 or below. With milks from the Chicago area only one of the 19 brands was higher than 4.07. Since the milk samples of high protein reducing values were predominantly from an area where shortage of fluid milk is likely to occur during the winter months, the possibility of the presence of added reliquefied nonfat dry milk solids or other forms of processed milk solids is indicated. However, to eliminate the possibility of geographic influence on the protein reducing value of milk, additional samples of both homogenized and unhomogenized pasteurized fluid milk were collected from various sections of the country and similarly analyzed. Data obtained from this second survey also are presented in figure 1.

Of the 50 brands of fluid milk (including two from central Illinois), representing products of 28 different plants located in 16 different states, only two have protein reducing value above 4.07 mg of potassium ferrocyanide per 100 ml of milk. Of these two the one from Oregon was pasteurized at the unusually high temperature of 182°F for 16 seconds and, for this reason, would be expected to have a slightly higher value than normal. The majority of the samples have protein reducing values between 2.5 to 3.5 mg per 100 ml which were also found for milks from the Chicago area. There does not appear to be any difference in the protein reducing values of milk from different sections of the country in this second survey. Homogenized milk tends to have a slightly higher value than unhomogenized milk from the same plant, probably because of the generally higher temperature used in pasteurization of homogenized milk.

The effect of seasons was not extensively investigated. Based on the analysis of a few brands of milk from the Chicago area from the fall of 1951 to the fall of 1952, there

TABLE 1—PROTEIN REDUCING VALUES AT DIFFERENT LEVELS OF ADDITION OF RELIQUEFIED SPRAY PROCESS NONFAT DRY MILK SOLIDS TO PASTEURIZED FLUID MILK

Nonfat sample used	Whey protein N (mg/gm)	Prot. red. values (mgs.$K_4Fe(CN)_6$/100 ml) at different levels of added reliquefied milk				Increases in prot red value (mg$K_4Fe(CN)_6$/100 ml) at different levels of added reliquefied milk		
		0%	3%	5%	10%	3%	5%	10%
1	5.2	3.93	4.53	5.13	5.93	0.72	1.40	2.39
2	5.8	3.33	4.27	4.87	5.47	1.04	1.71	2.47
3	6.0	3.93	4.40	4.53	5.47	0.59	0.80	1.93
4	6.1	3.93	4.53	5.00	5.60	0.72	1.27	2.06
5	6.5	3.20	4.27	4.73	5.47	1.17	1.69	2.59
6	5.5	3.20	4.40	4.53	5.33	1.30	1.49	2.45
7	6.5	3.20	4.27	4.73	5.47	1.17	1.69	2.59
8	5.5	3.20	4.46	4.60	5.33	1.20	1.56	2.45
9	5.5	3.53	4.13	4.57	6.07	0.71	1.22	2.89
10	7.1	3.53	4.27	4.93	6.27	0.85	1.58	3.09
11	6.5	3.53	4.87	5.20	6.07	1.45	1.85	2.89
12	6.4	3.53	4.46	4.73	5.07	0.93	1.38	1.89
13	6.7	3.67	4.27	4.93	5.80	0.71	1.44	2.50
14	6.1	3.67	4.27	5.20	6.00	0.71	1.71	2.70
15	7.4	3.53	5.07	5.33	7.67	1.65	1.98	3.49
16	6.7	3.53	5.67	6.27	9.60	2.25	2.92	6.42
17	7.3	3.53	4.93	5.47	6.87	1.51	2.12	3.69
18	6.4	3.00	4.46	4.73	6.87	1.55	1.88	4.17
19	6.1	3.53	4.46	4.73	6.07	1.04	1.38	2.89
20	7.9	3.00	3.47	3.93	4.27	0.56	1.08	1.50
21	7.7	3.00	3.33	3.67	4.07	0.42	0.82	1.37
22	8.3	3.00	3.93	4.27	5.07	1.12	1.42	2.37
23	6.6	3.00	4.07	4.46	5.33	1.16	1.61	2.63
24	5.6	3.00	3.80	4.07	5.07	0.89	1.22	2.37
25	6.0	3.00	4.27	4.60	5.80	1.36	1.75	3.10
26	7.8	3.00	4.07	4.46	4.73	1.16	1.61	2.03
27	7.8	3.00	4.27	4.60	5.07	1.36	1.75	2.37
28	7.6	3.00	4.27	4.60	5.07	1.36	1.75	2.37
29	1.9	3.33	5.47	6.07	7.53	2.24	2.91	4.53
30	1.4	3.33	5.00	6.07	8.27	1.77	2.91	5.27
31	1.3	3.80	4.87	5.33	6.80	1.18	1.72	3.38
32	1.3	3.80	5.00	5.47	7.13	1.31	1.86	3.71
33	1.2	3.33	7.13	8.33	12.87	3.90	5.17	9.87
34	1.2	3.33	4.07	5.00	6.80	0.84	1.84	3.80
35	1.1	3.00	4.00	4.53	6.40	1.09	1.68	3.70
36	1.1	3.00	4.00	4.07	5.00	1.09	1.22	2.30
37	1.1	3.33	7.00	8.60	12.87	3.77	5.44	9.87
38	0.96	3.33	4.87	5.60	7.67	1.64	2.44	4.67
39	0.96	3.80	5.00	5.60	6.67	1.31	1.99	3.25
40	0.84	3.33	4.87	5.13	7.27	1.64	1.97	4.27
41	0.84	3.33	6.20	8.20	13.00	2.97	5.04	10.00
42	0.72	3.20	4.73	5.00	7.13	1.63	1.96	4.25
43	0.72	3.33	4.33	5.33	6.33	1.10	2.17	3.33
44	0.60	3.93	7.13	9.33	14.00	3.32	5.60	10.46
45	0.84	3.53	4.93	5.27	8.00	1.51	1.92	4.82

does not appear to be any seasonal effects on the protein reducing value of milk.

It is difficult to ascertain with the available information thus far obtained the cause or causes of the high protein reducing values in some of the milks. However, it is logical to assume that a high protein reducing value may be due to either (1) excessive heat treatment in pasteurization or (2) the addition of reliquefied nonfat dry milk solids or other forms of processed milk solids. The first possibility must be eliminated before the second can be established. For this reason the effects of pasteurization and of heat treatment, in general, on the protein reducing value of milk was next studied.

Effects of Pasteurization and Heat Treatment. Three series of experiments were run, two with raw milk and one with pasteurized fluid whole milk. In each series 60 ml portions contained in 125-ml Erlenmeyer flasks were heat-treated in a water bath at different temperatures and for different periods with the conditions selected varying from those normally used in

high-temperature-short-time (H.T.S.T.) and batch pasteurization to well above pasteurization conditions. Approximately 2 minutes were required to reach the desired temperature. After heat treatment each portion of milk was immediately cooled in an ice bath to a temperature below 20°C. Analyses were made for protein reducing substances and whey protein nitrogen[11]. Data are presented in table 2.

Pasteurization of milk at temperatures not over 175°F for 16 seconds in the H.T.S.T. process or not over 150°F for 30 minutes in the batch process produces very little change in the protein reducing values. Above these temperature-time combinations the protein reducing value increases progressively. Since 175°F for 16 seconds and 150°F for 30 minutes probably represent the top limits used ordinarily in commercial H.T.S.T. and batch pasteurization, respectively, it may be reasonable to conclude that normal pasteurization has very little effect on the protein reducing value of milk. This conclusion is also supported by the available information on the pasteurization of the milk samples from the different areas of the country.

Differentiation of Milks of High Protein Reducing Values. On the basis of the above findings, a knowledge of the pasteurization conditions used will be helpful in deciding whether a high protein reducing value of a given milk sample is caused by excessive heat in pasteurization or by the presence of some form of processed milk solids. Such information may not always be available nor reliable. Effort was therefore made to find a test which would help distinguish these two possibilities. For this purpose, the Harland-Ashworth method[11] for undenatured whey protein nitrogen was investigated. It was believed that excessive heat treatment would denature part of the whey proteins, while the addition of nonfat dry milk solids, particularly of the "low heat" type, would have little effect on the whey protein content under normal pasteurization conditions.

Using the data from table 2 a plot of the whey protein nitrogen content against protein reducing value has been made and is shown in figure 2. This indicates a definite relationship between these two quantities, or probably more correctly, between the fraction of the total whey protein denatured and the protein reducing value. However, since the original whey protein content of an unknown milk sample cannot as yet be determined, the quantity of undenatured whey protein or their nitrogen equivalent must be used in this correlation. Any milk that has a high protein reducing value due solely to excessive heat treatment would be expected to follow this relationship with perhaps slight deviations due to the normal variation of the whey protein content of milk. If, on the other hand, such a sample of high protein reducing value deviates extremely from this relationship by also having a very high whey protein nitrogen content, that is very little denaturation of the whey proteins, it is an indication that reliquefied nonfat dry milk solids or other processed milk solids is present.

That the addition of reliquefied nonfat dry milk solids to pasteurized fluid whole milk has only a

TABLE 2—THE EFFECTS OF HEAT TREATMENT ON THE PROTEIN REDUCING SUBSTANCES AND UNDENATURED WHEY PROTEIN N OF FLUID WHOLE MILK

Heat treatment		Whey protein N, mg/ml.			Protein reducing value, mg $K_4Fe(CN)_6$/100 ml		
°F	Time	Milk 1*	Milk 2*	Milk 3**	Milk 1	Milk 2	Milk 3
None		0.74	0.78	0.61	2.50	2.67	2.60
145	30 mins.	0.73	0.77	0.55	2.63	2.87	3.20
145	60 "	0.67	.....	.....	2.96	.....	.....
150	30 "	0.73	0.76	0.55	2.90	2.73	3.47
150	60 "	.....	0.67	0.49	.....	3.77	4.00
155	30 "	0.65	0.68	0.55	3.04	2.73	4.00
160	30 "	0.54	.....	.....	3.34	.....	.....
170	16 secs.	0.72	0.67	0.59	2.44	2.93	3.00
170	60 "	0.68	0.67	0.57	2.54	2.87	2.73
175	16 "	0.65	0.66	0.52	2.80	3.13	2.87
175	60 "	0.55	0.65	0.51	3.20	3.03	4.27
180	16 "	0.48	0.57	0.45	3.93	3.47	5.20
180	60 "	0.40	.....	.....	4.87	.....	.....
185	16 "	0.35	0.46	0.39	5.93	4.77	5.94
185	60 "	0.30	0.41	0.32	6.40	5.37	6.54
185	10 mins.	.....	0.11	0.12	.....	9.54	9.07
185	30 "	0.065	0.075	0.065	10.9	12.2	12.1
208	30 "	.....	0.042	0.048	.....	21.2	23.0

*Raw milk
**Pasteurized milk

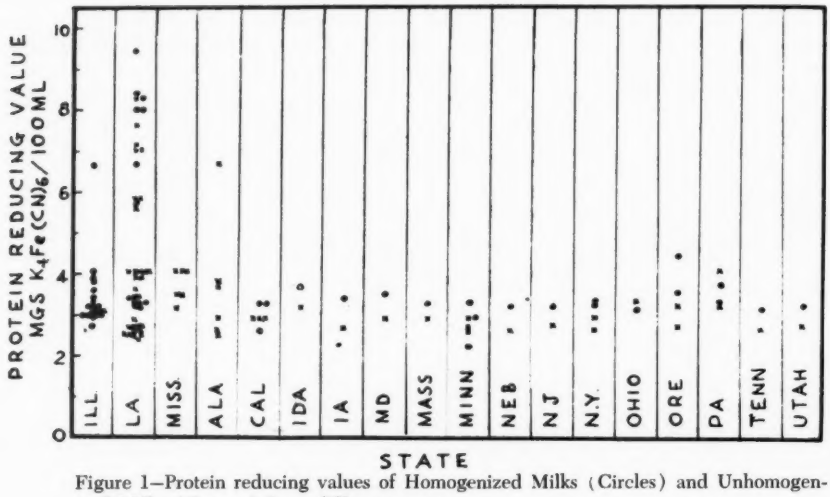

Figure 1—Protein reducing values of Homogenized Milks (Circles) and Unhomogenized Milks (Crosses) from different areas.

slight effect on the whey protein nitrogen value can be seen from the following consideration. Assuming that 10 percent of the reliquefied nonfat dry milk solids is added to fluid whole milk, the maximum reduction in whey protein nitrogen would be only about 0.1 mg per ml. This would be the case where the nonfat dry solids used is of the "high heat" type, containing very little undenatured whey proteins and where the fluid milk has a high whey protein nitrogen content of 1 mg per ml. However, because of the high heat treatment used in the manufacture of this type of dry milk, the protein reducing value is generally very high and will be reflected in the reducing value of the fluid milk containing the reliquefied nonfat dry milk solids. If the nonfat dry milk solids used is of the "low heat" type, in which very little of the whey proteins has been denatured in processing, the addition of even 10 percent of the reliquefied product will produce little or no change in the whey protein nitrogen content of the milk. In contrast, heat treatment at temperatures above those ordinarily used in pasteurization will cause a significant decrease in the whey protein nitrogen content of milk.

In figure 3, the protein reducing value is plotted against whey protein nitrogen content for some milk samples on which such data are available. The solid curve represents the relationship between protein reducing value and whey protein nitrogen taken from figure 2. It will be noted that out of the thirteen milks which had protein reducing values above 4.07 mg, two appear to be due to excessive heat treatment, and eleven appear to be due to added processed milk solids.

Reliability of the Method. The results obtained on the effect of pasteurization and on milk samples collected from different areas of the country indicate that the value of 4.07 milligrams might be a reasonable upper limit for normal fluid milk. This is also supported by the fact that the few milks with value above this were predominantly from an area of fluid milk shortage and some have been shown by the supplementary whey protein nitrogen test to contain added processed milk solids. On this basis, any milk yielding a value in excess of 4.07 milligrams would be considered a "questionable" milk. If the available information on its pasteurization or application

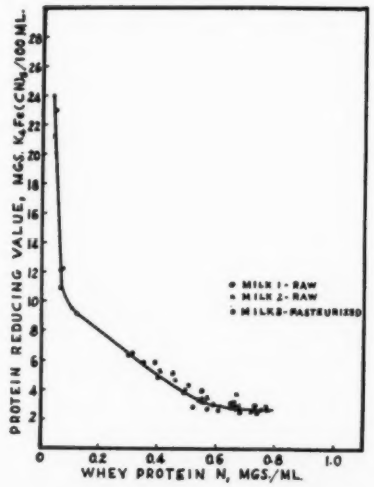

Figure 2—The Relationship between Protein Reducing Value and Whey Protein Nitrogen for Fluid Whole Milk Heat Treated under Various Conditions.

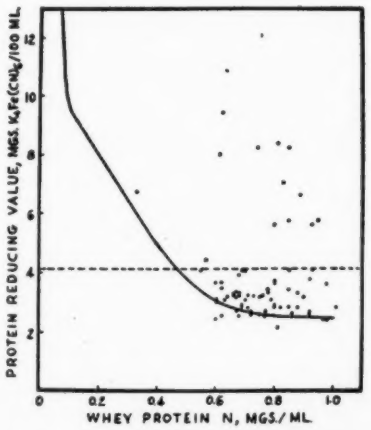

Figure 3—A Plot of the Protein Reducing Value against Whey Protein Nitrogen for Pasteurized Fluid Whole Milk from different Areas (Solid Curve from Fig. 2).

of the whey protein test shows that the high value is not due to excessive heat treatment, it is an indication that such a milk contains either reliquefied nonfat dry milk solids or other processed milk solids.

The sensitivity of the present method can be estimated. If the fluid milk having the lowest reducing value, namely 2.17 milligrams, is assumed to be the milk being extended then at the 3, 5, and 10 percent level of addition the added reliquefied nonfat dry milk solids must be available to contribute at least 1.97, 2.01, and 2.12 mg of protein reducing substances per 100 ml of milk, respectively before its presence can be indicated by this method. These figures are calculated as follows:

$$4.07 - \frac{2.17\ (\%\ \text{fluid milk})}{100}$$

The amounts of protein reducing substances contributed by different samples of reliquefied nonfat dry milk solids when 3, 5, and 10 percent were added to different samples of pasteurized fluid milk have been calculated and are shown in table 1. The results indicate that six out of the 45 samples of reliquefied nonfat dry milk solids can be ascertained at the 3 percent level of addition, 10 at the 5 percent level, and 39 at the 10 percent level. In practice, the method may be more sensitive than indicated, since the value of 2.17 is the lowest found from milk.

Using the data presented in table 1, the sensitivity of the method for indicating the presence of 5 percent reliquefied nonfat dry milk solids in fluid milk of various protein reducing values can be calculated. For example, 10 of the 45 samples of nonfat dry milk solids will yield values above 4.07 mg per 100 ml at the 5 percent level of addition, when the fluid milk being extended is of the lowest protein reducing value. When the protein reducing value of the fluid milk is 2.57 mg, a value which covers 92 percent of the normal fluid milk, 62.2 percent of the samples of nonfat dry milk solids will give values above this limit. Finally, with fluid milk having the median value of 3.20 mg, 97.8 percent of the nonfat dry milk solids samples can be ascertained at the 5 percent level of addition. If a sample of the fluid milk is available for comparison, this method is probably sensitive to as little as 3 percent of reliquefied nonfat dry milk solids.

This method has not been applied to fluid milk containing other types of processed milk such as condensed milk, but it may be applicable also.

ACKNOWLEDGMENT

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SUMMARY

A method has been developed which appears to be reliable for indicating the presence of reliquefied nonfat dry milk solids in pasteurized fluid milk. This method is based upon the determination of the ferricyanide reducing value of the protein fraction of milk.

When different samples of spray process nonfat dry milk solids were reliquefied and added in amounts of 3, 5, and 10 percent to pasteurized fluid milk, the protein reducing values increase with the quantities of reliquefied product added.

Normal pasteurization temperatures and times produce little or no increase in the protein reducing value, but excessive heat treatment will produce progressive increases.

Based on the examination of 117 different brands of milk from different areas of the country, it was found that a protein reducing value of 4.07 mg potassium ferrocyanide per 100 ml of milk might be tentatively established as the maximum value for normal pasteurized milk. Any values above this indicate either excessive heat treatment during pasteurization or the presence of reliquefied nonfat dry milk solids or other processed milk solids. If information on the pasteurization of the milk is not available, it is possible to differentiate these two possibilities by means of a relationship between the protein reducing value and whey protein nitrogen obtained by heat treating milk under different conditions Any milk that has a high protein reducing value due solely to excessive heat treatment is expected to follow this relationship. If, on the other hand, such a sample of high protein reducing value deviates from the above relationship by having a very high whey protein nitrogen content, it is an indication that reliquefied nonfat dry milk solids or other processed milk solids is present.

The method appears to be very reliable for indicating added reliquefied nonfat dry milk solids in pasteurized fluid milk at the 10 percent level of addition but is somewhat less reliable at the 5 percent level. However, if a sample of the original fluid milk is available for comparison, the method will probably indicate the presence of as little as 3 percent of reliquefied nonfat dry milk solids.

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Association News

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ADVANTAGES OF "RETAILER" FREEZER SPECIFIED IN NEW CHERRY-BURRELL BULLETIN

A six-page, two-color bulletin featuring the "Retailer" Soft Ice Cream Freezer, the only machine on the market that can serve two flavors or two colors of ice cream together in one continuous stream, has just been issued by Cherry-Burrell Corporation. Bulletin tells how the "Retailer" can be used as a continuous freezer or as a batch freezer.

For a copy of Bulletin G-483, write to Cherry-Burrell Corp., Dept. AS-8, 427 W. Randolph St., Chicago 6, Ill.

WORLD CONGRESS ON MILK UTILIZATION

An historic World Congress for Milk Utilization will be held in Washington, D. C. November 20-21, under the sponsorship of the Dairy Industries Society, International. Meetings will be held at the Statler Hotel.

The following are some of the problems that will be discussed by world leaders:

"What are the needs for, and importance of, milk and milk products in areas throughout the world?"
"What are the advantages of moving milk products from surplus areas to shortage areas?"
"How can successful milk movement programs be inaugurated?"
"What can leaders in world trade and finance do to augment the satisfactory movement of surplus supplies?"
"What are the economic problems involved?"
"Technical problems and how to solve them?"
"Are international relationships improved by an advanced milk utilization program?"
"Why the enhancement of dairy enterprise in all lands builds agricultural wealth, industry, health, and happiness among peoples?"
"How are the problems of introducing and distributing milk products in shortage areas to be solved?"
"What educational and promotional programs are needed in milk shortage areas?"
"Problems of dairy agricultural development (grassland, cattle breeding, and feeding), milk production, handling, processing, distribution."

It is planned that the World Congress be regularly reconvened, so that year-by-year its investigations, its counsel and its actions can be applied to basic problems which will require long-range attack. Each Congress session will enable Dairy Industries Society, International and those who support it in fifty lands to move forward—stronger and more effective than ever before. It will aid agricultural, industrial, social and legislative leaders in their ever more complex tasks. Its benefits will touch consumers here and throughout the world and will all the while have exceedingly constructive effect in welding the ties among free peoples and against world Communism.

The Dairy Industries Society, International, headquarters is in Washington, D. C. Organized in 1946, its aim is to foster worldwide dairy progress by increasing consumption of milk and milk products and by modernizing dairy technology. It offers progressive dairymen throughout the world an opportunity to exchange information and ideas, make surveys, and develop area plans.

As a non-profit, educational organization its only source of funds is membership dues and contributions.

Its members are individuals, companies, and associations. Among these members are dairy farmers, dairy cattle breeders, milk dealers, dairy products manufacturers, equippers and suppliers, technologists, health and sanitation authorities, government officials, educators, and students.

Lester Olsen, Milwaukee publisher, is president. Other officers are: vice president Milton Hult, of Chicago, president of the National Dairy Council; treasurer, Roy E. Cairns, industrialist, of Waukesha, Wisconsin; and managing director; Roberts Everett, of Washington, D. C.

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FACTORY INSPECTION NOW ENFORCED UNDER FEDERAL FOOD, DRUG AND COSMETIC ACT

The Food and Drug Administration of the Department of Health, Education, and Welfare has begun to put into effect the provisions of the new inspection amendment to the Federal Food, Drug, and Cosmetic Act. FDA inspectors are now giving written notice of intention to inspect at the time when they present their credentials to the owner, operator, or agent in charge of the plant. Such notices give the date, time of day, name of the inspector, and the address of the district office to which he is assigned, and the name and address of the plant.

Inspectors are also leaving written reports on conditions or practices which indicate that any products in the establishment contain filth or decomposition or have been prepared, packed, or held under insanitary conditions.

In compliance with other provisions of the new law, inspectors are now given written receipts for all samples taken in connection with an inspection. District offices of the Food and Drug Administration will report promptly to the management of food plants the results of analyses of food samples taken in such plants for determining the presence of filth or decomposition. While some phases of FDA inspections are now clearly on a mandatory basis, there are others which Congress apparently intended to be put on a voluntary basis.

The law provides penalties for refusal to permit inspection of factories, warehouses, establishments or vehicles in which foods, drugs, cosmetics or devices are manufactured, processed, packed, or held for introduction into interstate commerce, or held after such introduction, or in which they are transported, and all pertinent equipment, finished and unfinished materials, containers and labeling therein.

NEW FISHERIES TECHNOLOGY COURSE AT U. MASS.

New four-year undergraduate programs leading to the bachelor of science degree in fisheries technology and in food management will be set up at the University of Massachusetts this fall, Dr. Dale H. Sieling, dean of agriculture and horticulture has announced.

Both curricula will be administered by the food technology department, headed by Dr. Carl R. Fellers. The food management course will be separate from a two-year non-degree course now offered by the same department, Dr. Sieling said.

The fisheries technology program will be offered in response to urging by civic, industrial, and educational agencies in New England seaboard cities. At present, the only fisheries school in the United States is located on the west coast at the University of Washington.

USPHS TRAINING PROGRAMS AT HEALTH CENTER

Training in the fields of radiation hygiene, water pollution control, sewage and waste treatment, water purification, milk and food sanitation, and atmospheric pollution is being covered by courses offered at the Environmental Health Center, Cincinnati, Ohio, under the U. S. Public Health Service. These technical training courses are designed for professional personnel from state and local health departments, water pollution control agencies, the Public Health Service, and other governmental units. Industrial representatives who are cooperating with these agencies on related programs also are eligible to attend.

The Center will assist state agencies in planning or conducting field technical sanitation and radiological health training courses. Also, arrangements are made for special training for foreign public health engineers and scientific personnel. Short topical courses dealing with special problems will be scheduled as the needs develop.

A prospectus of the course has been issued by the Environmental Health Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

The Schedule of the training courses follows:

Advanced Sanitation Training Courses

September 17-18—Short Course on Fluoride Analysis
September 23-25—Seminar on Individual Household Sewage Disposal Systems
October 12-16—Membrane Filter in Bacteriological Analysis of Water
November 2-6—Nuisance Organisms in Water Supplies
November 30-December 11—Advanced Training for Sanitary Chemists in Water Pollution Investigations
January 11-15—Advanced Training in Bacteriological Examination of Water.
January 18-22—Advanced Training in Bacteriological Examination of Milk and Dairy Products
January 25-29 – Food Sanitation Training
February 16-18—Short Course in Phenol Determination
March 8-19—Advanced Training for Sanitary Engineers in Water Pollution Abatement Programs
April 7-9—Bioassay of Industrial Wastes
May 3-7—Membrane Filter in Bacteriological Analysis of Water
May 19-21—Short Course in the Analysis of Metals in Industrial Wastes
June 8-11—Advanced Training for Aquatic Biologists in Water Pollution Control
Date determined by interest—Emergency Sanitation Training

Radiological Health Training Courses

October 5-16—Basic Radiological Health Training
October 19-30—Intermediate Course—Radiological Health
January 11-22—Basic Radiological Health Training
January 25-February 5—Intermediate Course—Radiological Health
February 8-19—Advanced Course—Radiological Health and Occupational Radiation Protection
May 3-14—Basic Radiological Health Training
May 17-28—Intermediate Course—Radiological Health
To be announced later – Short Course for Water Works Personnel

Applications for these training courses are to be sent to:

Officer in Charge
Environmental Health Center
Cincinnati, Ohio

No tuition is charged. Trainees will arrange for their own living and travel expenses. Hotel reservations will be made for accepted applicants upon their request.

All letters of application should give the name and a brief outline of the education and experience of each candidate and it should be accompanied by the appropriate recommendation of his superior. Applications should be received at the Environmental Health Center at least six weeks in advance of the starting time of the course.

FOOD DEVELOPMENTS IN BRITIAN

(*Continued from page 237*)

Functions

In order to administer the food laws governed by these Regulations, a Food Standards and Labelling Division was set up within the Ministry.

From the time of its inception in 1943 until early in 1952 the Division included among its functions an advisory service. This service proved helpful to manufacturers and packers, who were invited to submit labels for the scrutiny of the Division which advised them whether or not they were free from criticism in the light of Regulation 1 of the Defence (Sale of Food) Regulations and the Labelling of Food Order, which became operative in 1945. The Ministry had no power to insist upon alterations being made, since only a court of law can decide with authority if any infringement of Orders has taken place, but, if advice was accepted and acted upon, manufacturers and packers were protected from prosecution under the above mentioned enactments. The service was of great value to the consumer also, in so far as it prevented misleading labels reaching the market. This advisory function was discontinued, as a Government economy measure, in 1952.

Under the powers granted by the Defence (Sale of Food) Regulations, the Minister of Food has made, in addition to the Labelling of Food Order, the Food Standards (General Provisions) Order and several Food Standards Orders relating to the composition of specific foods.

Organization

The Division, which belongs to the Services Department of the Ministry, is a small one with offices in London. It has no area or regional organisation. Its work is divided between the following three sections:

1. Standards Secretariat;
2. Liaison with Food and Drugs Authorities, and general policy; and
3. Chemists' Section.

Standards Secretariat

The work of this section was described in some detail in *Bulletin No.* 626, of November 24th, 1951, in an article entitled "Protecting the Consumer." In brief, it conducts all the secretarial duties related to the work of the Food Standards Committee, which, at the request of local authorities, professional societies, food trade organizations, etc., considers and recommends the compositional standards of foods.

The personnel of the Committee consists of the Ministry's Chief Scientific Adviser, as Chairman, and representatives of the Ministries of Food and Health, the Department of Health for Scotland, the Medical Research Council, the Society of Public Analysts and other Analytical Chemists, and other nominated experts in the field of food technology.

To date, standards have been prescribed for seventeen different foods. These are: baking powder and golden raising powder, coffee mixtures, cream, curry powder, edible gelatine, fish cakes, fish paste, ice-cream, liquid coffee essences, meat paste, mustard, preserves (including mincemeat and fruit curd), salad cream and mayonnaise, self-raising flour, shredded suet, table jellies, and tomato ketchup. A list of the relevant Orders is appended to this article. Other foods now under consideration by the Committee include jams and marmalades, saccharin tablets, table jellies, and processed cheese and cheese spread.

As with the Labelling of Food Order, the duty of enforcing the Food Standards Orders devolves on local Food and Drugs Authorities.

The Food Standards Committee has appointed two Sub-Committees. The first of these is responsible for reviewing and reporting on the effects of the presence of metallic contaminants in certain foods, and for recommending, where appropriate, the limits of contamination which should be imposed.

Investigations have been completed and reports about arsenic, lead, and copper have been published: the Sub-Committee are now considering the representations received from the food trade and other sources since the publication of these reports. Reports on fluorine and tin in canned foods have been considered and adopted by the Food Standards Committee but have not, as yet, been approved for publication. Other trace metals now being considered are zinc, antimony, and cadmium, and it is expected that these inquiries will shortly be completed and the reports submitted.

The second Sub-Committeee, the Preservatives Sub-Committee, was

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set up to investigate the use of preservatives and coloring matters in food, and also the use of such substances as anti-oxidants, anti-mold agents, emulsifying agents (including stabilizing, anti-staling, and foaming agents). Separate reports will be prepared in respect of each class of substance.

The use of anti-oxidants has already been considered and discussed with trade and other interested organizations, and a report will shortly be submitted to the Food Standards Committee. Preliminary consideration has also been given to representations received on the use of coloring matters in foods.

Liaison with Food and Drugs Authorities

As its name implies, this section acts as a channel of communication between Food and Drugs Authorities and the Ministry. The work of the section covers a variety of subjects including advice to Food and Drugs Authorities on the enforcement of the Defence (Sale of Food) Regulations, the Labelling of Food Order, the various Standards Orders, the Food and Drugs Act, the Public Health (Preservatives, etc., in Food) Regulations, etc.; advice to these authorities on the intention of the Ministry's Commodity Control Orders; the approval of the appointment and removal of Public Analysts; examination of Public Analysts' quarterly reports; the negotiation with Trade Associations of Codes of Practice (which may be described as unofficial standards based on voluntary agreement rather than the force of law), and a number of other duties of a comparatively minor nature.

The section also maintains liaison with the Board of Trade in regard to weights and measures and merchandise marks legislation.

Chemists' Section

The need for expert scientific advice within the Division is conditioned by the degree of scientific control existing within the food industry. Guidance is needed, for example, on the technical terms and names used by that industry; the assignation of "appropriate designations" to the diverse ingredients used, and the validity of the various claims made by manufacturers in respect of their products, particularly as regards "dietary and nutritional value." Of particular importance is the group of diverse products lying in the hinterland between "food" and "drug." The new definition of "food" in the Labelling Order removed uncertainty about the classification of products as varied as malt extract preparations, so-called "tonic" wines, cod liver oil, "herbal teas," yeast preparations, "health" drinks, vitamin preparations, etc., but decisions could only be effected after careful assessment of technical advice on the properties, composition, and uses of a product. In matters of labelling, therefore, the section tries to assist a manufacturer to frame a label in terms merited by the composition of the product and understandable by the purchaser; at the same time it tries to survey the result through the coldly critical eye of the Public Analyst, the Medical Officer of Health, or the Food and Drugs Authority.

The Technical Secretaries of the Food Standards Committee and of the Sub-Committee on Preservatives are members of the Chemical Section which is responsible for the collection, assessment, and arrangement of scientific and technical information or data which either committee may require.

Although the Public Health (Preservatives, etc., in Food) Regulations have been in existence for more than twenty-five years, requests for information on, or elucidation of, points arising from the terms of the Regulations are still being received and are dealt with by the section. Liaison with outside bodies, such as the British Standards Institute or the various research associations, on technical matters is usually effected through the Chemists' Section, which is frequently consulted on scientific topics by other Divisions of the Ministry.

Footnotes

(a) See "The Ministry of Food, Its Functions and Organization," *Bulletin No.* 671, October 5th, 1952.

(b) The definition of Food and Drugs Authorities was given in "Food and Drugs Legislation—The Local Authority's Responsibility—Part I" which was published in *Bulletin No.* 654, on June 7th, 1952.

(c) At the date of going to press the chairman of the Committee was: Dr. Norman C. Wright, M. A., D.Sc., Ph.D., F. R.I.C. Joint Secretaries—Mr. C. Ellis and Mr. W. M. Shortt, Ministry of Food.

(d) At the date of going to press the chairman of the Metallic Contamination Sub-Committee was Mr. G. G. Barnes, C.B.E. Secretary—Mr. B. W. Smith, Ministry of Food.

(e) At the date of going to press the Chairman of the sub-Committee was Professor E. C. Dodds, M.V.O., M.D., D. Sc., F.R.C.P., F.R.I.C., F.R.S. Joint Secretaries—Mr. W. A. Godby, M.B.E. and Mr. B. W. Smith, Ministry of Food.

Appendix

The following is a list of the Food Standards Orders made under the Defence (Sale of Food) Regulations, S.R. & O. 1943 No. 1553, as amended by S.R. & O. 1945, No. 1454. The orders should be read in conjunction with the Food Standards (General Provisions) Order, 1944, as amended (S.R. & O. 1944, Nos. 42 and 654).

*Baking Powder and Golden Raising Powder: S.R. & O. 1944 No. 46.
Coffee Mixtures: S. I. 1952, No. 1697.
Cream: S.I. 1951 No. 668.
Curry Powder: S.I. 1949 No. 1816.
Edible Gelatine: S.I. 1951 No. 1196, as amended by S.I. 1951 No. 2240.
Fish Cakes: S.I. 1950 No. 589.
Fish Paste: S.I. 1951 No. 1456, as amended by S.I. 1951, No. 2241.
Ice-Cream: S.I. 1951 No. 13, as amended by S.I. 1952, No. 1283.
*Liquid Coffee Essences: S.R. & O. 1945 No. 389.
Meat Paste: S. I. 1951 No. 1457, as amended by S.I. 1951, No. 2242.
*Mustard: S.R. & O. 1944 No. 275.
Preserves (including Mincemeat and Fruit Curd): S. R. & O. 1944, No. 842, as amended by S. R. & O. 1946 No. 1221; S.I. 1949 No. 1893; and 1950, Nos. 1056 and 1871.
*Salad Cream and Mayonnaise: S.R. & O. 1945 No. 1177.
Self Raising Flour: S.R. & O. 1946 No. 157.
*Shredded Suet: S.R. & O. 1944 No. 45.
Table Jellies: S.I. 1949 No. 1656.
Tomato Ketchup: S.I. 1949 No. 1817.
*See also S.R & O. 1946 No. 157.

MICHIGAN DAIRY MANUFACTURES CONFERENCE

The 14th Annual Michigan Dairy Manufactures Conference will be held this year on Wednesday and Thursday, November 4 and 5, at the Kellog Center, Michigan State College. Three specialized groups of dairy processors: market milk; ice cream; and butter, cheese and dried milk, will meet concurrently for the two day session. An instructional clinic for dairy products will noon. A general banquet sponsored be conducted on Wednesday afterby the joint membership of the Detroit and Western Michigan Dairy Technology Societies is scheduled for Wednesday evening.

Classified Advertisement Positions Wanted

Milk and Food Sanitarian, B. S. in Dairy Industry, 7 years commercial dairy industry experience and 10 years Public Health Milk Sanitation experience in a supervisory capacity.

Desires position as Chief Sanitarian of milk division or would consider commercial field work and quality control. Prefer Mid-west. Box 437, Shelbyville, Indiana.

Postion wanted by Milk Sanitarian with 16 years experience in Bottle and bulk Grade "A" plant operations. Fully qualified as Laboratory Technician as set down under Wisconsin Standard Methods. Experienced in plant and farm inspection.

Dairy School Graduate (Major Dairy Husbandry and Bacteriology)

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References can be cheerfully had on request. Box 437 Shelbyville, Indiana.

FREE BOOKLET TELLS CHURCHES AND CLUBS HOW TO MAINTAIN SANITATION WHEN SERVING SNACKS OR MEALS

A diplomatic way to carry rules of sanitation to amateur food handlers in churches, clubs and other groups is being offered by the Paper Cup and Container Institute in the form of a booklet called "Serving Successful Snacks and Meals."

Frankly produced to encourage the use of paper for such purposes the booklet nevertheless covers the whole field of non-professional group feeding regardless of the service used.

Special emphasis is placed on sanitation and the potential dangers of food poisoning in informal food service. Two sections are devoted to the subject. Headed "It was good but was it safe?" and "How you can be safe instead of sorry" the sections cover the most common causes of food poisoning and present six basic rules for sanitary food service.

Offered free of charge to health departments for distribution to organizations serving snacks or meals the book is a valuable guide to food service for any social or fraternal group. Its thirty-two pages include facts and tips about: the equipment needed, attracting attendance, simple planning methods, making up a budget, cooking in quantity, guaranteeing good service, and what prices to charge. Cartoon illustrations, charts and photographs explain how to buy the right quantity of food for 25, 50 or 100 guests; what quantity of each type of food makes a satisfactory portion; and how to schedule preparation and service.

Sample copies of the booklet may be had by writing to the Public Health Committee, Paper Cup and Container Institute, Inc., 250 Park Avenue, New York.

CREAMERY PACKAGE APPOINTS NEW MANAGER TO SALT LAKE CITY BRANCH

According to a recent announcement by Mr. J. L. Brazee, Vice-President, The Creamery Package Mfg. Company, Mr. Blaine Anderson has been promoted to Manager of CP's Salt Lake City Branch.

Mr. Anderson was raised on a dairy farm in Provo, Utah. After attending Utah State Agriculture College he went to work for a subsidiary of Pet Milk Company (Cloverleaf Dairy and Colville Ice Cream Company) in Salt Lake City, spending five years as Plant Superintendent at Colville Ice Cream Company.

Later, he became a salesman for Waratek Chemical Company in Salt Lake City and early in 1950 Joined Creamery Package in a sales capacity where he attained the position of Assistant Sales Manager, a post he held until his recent appointment.

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FREE BOOKLET F7985 gives details. Write Oakite Products, 38C Rector St., New York 6, N. Y.

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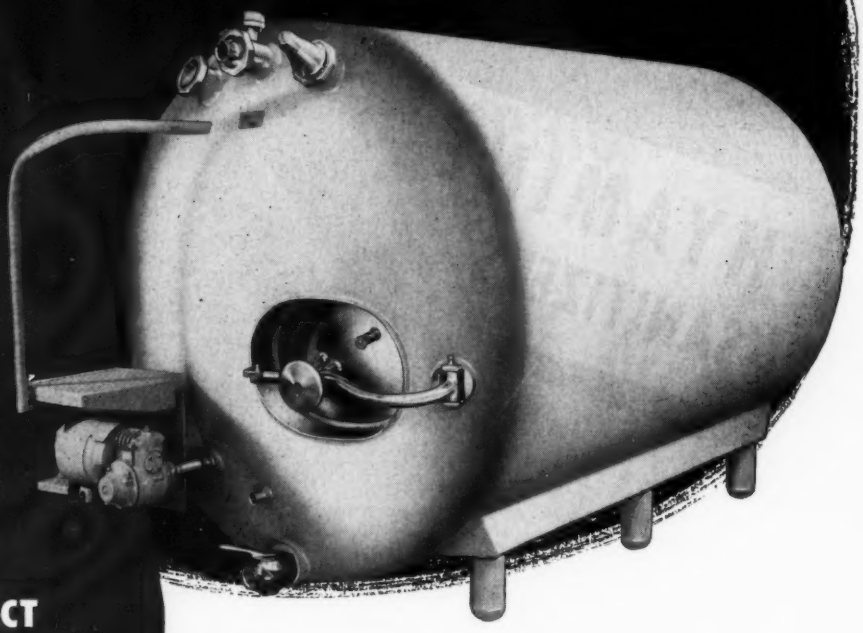

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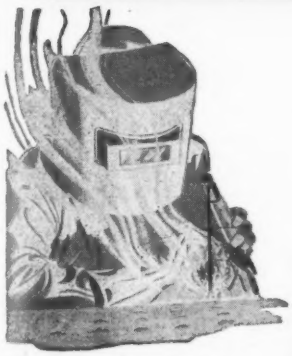

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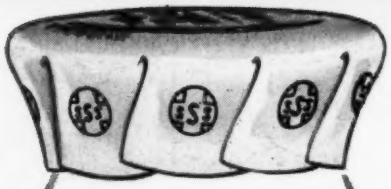

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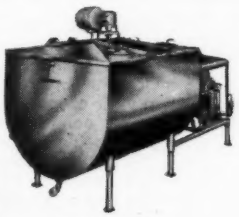

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